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The Great Basin Naturalist

VOLUME XVIII, 1958

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ADDITIONAL DATA ON THE BIRDS OF THE UINTA MOUNTAINS AND BASIN OF NORTHEASTERN UTAH

William H. Behle and Jon Ghiselin[1]

A notable contribution to Utah ornithology is Twomey's report (1942) on the birds of the Uinta Basin. Since completion of this project of the Carnegie Museum, personnel of the University of Utah have done considerable field work in the basin and the Uinta Mountains. It seems desirable to record the resultant information as well as some data from an earlier period, and also to summarize the information recorded by others since Twomey's study.

The field work conducted by the University of Utah began about 1930 when A. M. Woodbury and students did some general collecting in the area of Smith-Morehouse Creek, a tributary to the Weber River in Summit County at the western end of the Uinta Mountains. The Pack's Cañon where Ridgway (1877) collected in 1869 was somewhere in the same general area. During the summer of 1946, George K. Todd collected at Nobletts Ranger Station, 10 miles southeast of Kamas, and along Current Creek, 7 miles north of U.S. Highway 40. More intensive work was done during the summers of 1948 to 1950 by Robert Selander and Behle, particularly the former (see Selander, 1951). While studying the life history and behavior of the black rosy finch in the Mirror Lake area during the summer of 1953, Norman French (1954*a* and 1954*b*) collected rosy finches and several other apline species. During the summers of 1954 and 1955 Ghiselin (1956) conducted field investigations of the ecological distribution and frequency of occurrence of the birds of the high Uinta Mountains in and near Naturalist Basin, in northwestern Duchesne County. Although little collecting was done on this project, many sight records were obtained which bear on relative abundance and distribution. Twomey spent little time in the Uinta Mountains compared with his effort in the Basin, and then rarely above intermediate levels. Therefore in 1956, the two authors and Norman V. Chamberlain spent the interval from July 6 to 11 at Spirit Lake, 10,550 feet, situated almost on the Daggett-Summit County line, on the north slope of the eastern portion of the range. On July 11 we collected at the mouth of Birch Creek, 7100 feet, about 3½ miles south of the Utah-Wyoming border. The University of Utah now has 797 specimens from the region.

Attention should be given the continued interest in the Uinta Mountains of C. Lynn Hayward at Brigham Young University.

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While recently he has been most concerned with the general ecology of the range, he has paid considerable attention to birds. He has two publications since those listed by Twomey (see Hayward, 1945 and 1952).

Acknowledgments

The early field work was conducted under the auspices of the Department of Biology of the University of Utah. Later, grants-in-aid were obtained. The University Research Committee supported the work of Selander and Ghiselin, while French received a grant from the Frank M. Chapman Memorial Fund of the American Museum of Natural History. The work at Spirit Lake in 1956 was done under a grant to the senior author from the National Science Foundation. We are grateful for the aid from all these sources.

Ecologic Considerations

Graham (1937:79-80) has summarized and compared conclusions reached by several earlier workers in analyzing the plant and animal communities of the area. Twomey *(op. cit.)* treated the communities as follows: Mixed Desert Shrub (4500-5500 feet), *Juniperus-Pinus* (5500-7000), *Artemisia-Cercocarpus* (7000-8000 feet), an irregular ecotone between the *Artemisia* and *Populus aurea* communities (6000-8000 feet), *Populus-Rosa* Community (8000-8700 feet), *Pinus-Vaccinium* (8700-10,000 feet), *Picea-Abies* (10,000-11,000 feet) and *Sieversia-Carex* (above 11,000 feet). Hayward (1945) divided the montane forest of higher elevations into two types. the Upper Montane Coniferous Forest and the Lower Montane Forest. The former is a climax Engelmann spruce-alpine fir association with an undergrowth of low-growing shrubs and herbs, the most conspicuous shrub type being blueberry *(Vaccinium)*. He considers the lodgepole pine forest a subclimax. The lower Montane Forest is a climax association of yellow pine, Douglas fir, and white fir. The aspen also represents a subclimax. At its lower border it comes in contact with a chaparral ecotone.

Species List

Branta canadensis moffitti. Canada Goose. One specimen: Strawberry Reservoir, Oct. 16, 1954.

Anas platyrhynchos platyrhynchos. Mallard. Twomey (*op. cit*: 372) found this duck only as high as 6000 feet, while Hayward *(op. cit.:* 111*)* indicates that it occurs in the upper montane climax. Two were seen near a growth of water lilies on Scudder Lake. 10,100 feet, 1½ miles southwest of Mt. Agassiz, Duchesne County, on September 6. 1955. At present the species must be considered as an uncommon transient at the high lakes of the Uinta Mountains. although some mallards may breed in this habitat.

Accipiter gentilis atricapillus. Goshawk. One specimen: Mirror Lake. July 27. 1955. Twomey *(op. cit.:* 376*)* found this hawk from the aspen community to timberline. He suggested that the scarcity of the species might have been correlated with the paucity

of grouse. Ghiselin also found this hawk scarce. He obtained only two sight records. An immature was seen at 9500 feet, September 1, 1955 on the Stillwater Fork of the Bear River near Scow Lake, Summit County, in a lodgepole pine forest with some admixture of spruce and fir. Another observation was made nearby the following day. The specimen listed above was taken by Roger Claude as a nestling.

Accipiter striatus velox. Sharp-shinned Hawk. Our only sight record was obtained near timberline at McPheters Lake, 10,800 feet, at the head of Stillwater Fork of the Bear River, Summit County, September 5, 1955.

Accipiter cooperii. Cooper's Hawk. One specimen: Vernal Game Farm, September 10, 1948.

Buteo jamaicensis calurus. Red-tailed Hawk. One specimen, a partial albino: Smith-Morehouse Cr., 7100 feet, September 12, 1938. The species was seen only in areas of dense spruce-fir forest in the high Uintas. Hayward (1952:116) likewise reports this raptor over alpine communities and in both seral and climax stages of the upper montane (see also 1945:111). It ranges from the lowlands to the high mountains.

Buteo swainsoni. Swainson's Hawk. One specimen: Kamas, April 16, 1933.

Buteo lagopus s. johannis. Rough legged Hawk. Twomey did not list this species from the basin although he did record the Ferruginous Hawk *(Buteo regalis). Buteo lagopus* is a sparse transient in the area and probably a winter resident as well. We have two sight records:: Gatman Lake, 10,400 feet, Naturalist Basin, July 29, 1955 and near Scow Lake, 10,500 feet, Summit County. September 2, 1955. These records indicate both early migration and occurrence at high elevations.

Aquila chrysaëtos canadensis. Golden Eagle. One specimen: 2 mi. N. Tridell, 7000 feet. September 6, 1947. Twomey *(op. cit:* 380) found the species common. Hayward (1952) apparently did not find the species in alpine situations, but reports it (1945:54, 111) in the coniferous forest. Our data indicate that the species is a common resident in the mountains. We have nine sight records in the Uintas from 10,400 to 12,400 feet throughout the summer months for Naturalist Basin from 1952 to 1955.

Cirus cyaneus hudsonius. Marsh Hawk. Two specimens: Roosevelt, February 13, 1956 and Myton, February 28. 1956. The species, common in the lowlands, occasionally appears in the mountains: one was seen at Faxon Lake, 10,900 feet, Naturalist Basin on August 17, 1952, and one, possibly the same bird, at Jordan Lake, 10,600 feet, the same day.

Falco mexicanus. Prairie Falcon. Two specimens: Strawberry Valley, April 29, 1934, and 15 mi. S. Myton, April 24, 1938.

Falco sparverius sparverius. Sparrow Hawk. One specimen: Kamas, September 21, 1932. Hayward (1945:112) lists the species only in the lower montane, although Twomey *(op. cit.:* 383) states

that it ranges to timberline. One bird was seen near timberline east of Rocky Sea Pass, 11,000 feet, at the head of Rock Creek, Duchesne County, August 17, 1953.

Dendragapus obscurus obscurus. Blue Grouse. Three specimens: Paradise Park, 8000 feet, July 27, 1953 (juvenile); 1/4 mi. SW. Morat L., 10,450 feet, Naturalist Basin, August 9, 1955 (juvenile); 1/4 mi. SE. Mt. Agassiz, 10,300 feet, September 11, 1956. We have four sight records in aspens, spruce-fir forest, and shrubs on rocky talus slopes for Naturalist Basin, all in early August, 1955-56. Hayward (1945:67-69) lists the species in both upper and lower montane habitats, adding (1952:115) that it may frequently be found at timberline.

Bonasa umbellus incana. Ruffed Grouse. Four specimens: Stockmore, October 17, 1931; 13 mi. E. Oakley, November 25, 1950; Smith-Morehouse Cr., October 10, 1931. One was seen on Stillwater Fork of the Bear River, 8,900 feet, one mile south of Christmas Meadows, Summit County, on September 1, 1955, in a willow-birch thicket near aspens.

Centrocercus urophasianus urophasianus. Sage Grouse. Two specimens, both juveniles: Mud Cr., 6800 feet, Strawberry Valley, August 28, 1950.

Lophortyx californicus californicus. California Quail. One specimen taken in a cultivated field: Dry Fork Canyon, 6000 feet, 15 mi. N. of Vernal, June 29, 1950.

Porzana carolina. Sora. One specimen: Merkley Park, 10 mi. N. Vernal, June 21, 1949. It was taken in a willow thicket in a marshy area. Young were observed at the time.

Capella gallinago delicata. Common Snipe. Twomey (*op. cit.*: 391) found the species at many places in the Basin. We have a high altitude sight record for Pass Lake, 10,100 feet, Duchesne County on August 16, 1954.

Actitis macularia. Spotted Sandpiper. Four specimens (one a nestling): Gatman Lake, 10,400 feet, Naturalist Basin, August 22, 1954; Paradise Park, 10,000 feet, July 28, 1953; Spirit Lake, July 5-6, 1956. Twomey (*op. cit.*: 391), although citing several records, stated that these sandpipers were not numerous in the basin. Hayward (1931:151) had earlier reported the species as common. As corroboration of their abundance we have 40 additional sight records for the Naturalist Basin area alone extending through September 5. These sandpipers were ubiquitous at higher altitudes wherever there were lakes or extensive meadows. Although preferring the meadow habitat they were often seen on rocky lake shores. An incubating bird was observed in a meadow near Lost Lake, 10,000 feet, Wasatch County, on July 12, 1953.

Columba fasciata fasciata. Band-tailed Pigeon. A mounted specimen in the University of Utah collection was taken at Hanna, Duchesne County, sometime in July, 1930. Twomey did not find this species; it may have been extirpated in the basin.

Zenaidura macroura marginella. Mourning Dove. One specimen: Ryder Lake, 10,600 feet, head Stillwater Fork of Bear River,

Summit County, September 5, 1955. Twomey (*op. cit.*: 397) found this to be one of the commonest species in the basin and indicated that it occurred up to 8000 feet. Hayward (1945:67) reports doves only in the lower montane. The specimen noted above was an immature female taken on a rocky hillside. This canyon is a deep cirque, and the bird could have left it to the south only by crossing the saddle at 11,400 feet between Hayden Peak and Mount Agassiz.

Bubo virginianus lagophonus. Great Horned Owl. One specimen: Roosevelt, February 13, 1956. This is not only a new record for the basin but apparently the third record for the state of this race. Hayward (1937:305) reported one taken at St. George, Washington County, October 22, 1933 and Woodbury, Cottam and Sugden (1949:17) added a record for Boxelder County [=Dove Creek, Raft River Mountains], September 10, 1932.

Bubo virginianus occidentalis. Great Horned Owl. Two specimens: Soapstone Cr., 7750 feet, Summit County, October 27, 1940; Stewart Ranch, 7128 feet, 5 mi. SE. Woodland, Wasatch County, July 17, 1944. This is the breeding form of the area. Killpack (1951: 262) found remnants of a short-eared owl at a horned owl nest 5 miles northeast of Roosevelt.

Asio otus tuftsi. Long-eared Owl. Two specimens: Peoa, October 16, 1931 and 3 mi. S. Vernal, June 20, 1949.

Phalaenoptilus nuttallii nuttallii. Poor-will. Two specimens: Timothy Cr., 7500 feet, 10 mi. N. Altonah, Duchesne County, June 24, 1950; Merkley Park, 5500 feet, 10 mi. N. Vernal, September 4, 1949. The first was taken in manzanita (*Arctostaphylos*), the second in a juniper.

Chordeiles minor hesperis. Common Nighthawk. Twenty specimens: 12 mi. E. Oakley, 7500 feet, July 18-20, 1950; 5 mi. N. Duchesne, August 11, 1947; 5 mi. S. Duchesne, August 11, 1947. Selander (1954:75-6) in his systematic review of the western races of the species has noted the extremely variable nature of the breeding populations in the Uinta Basin. He found the examples from the western portion of the basin to be referable to *hesperis*.

Chordeiles minor howelli. Common Nighthawk. Thirteen specimens: Timothy Cr., 7500 feet, 10 mi. N. Altonah, June 23-24, 1950; 7 mi. N. Vernal, August 12, 1947; 3 mi. E. Vernal, August 13, 1947; 2 mi. S. Vernal, August 13, 1949; Vernal Refuge, 3 mi. S. Vernal, September 3, 1949. While Selander (*op. cit.*:75) refers examples from the eastern Uinta Basin to the race *howelli*, he states that they are integradational between *hesperis*, *howelli*, and possibly *henryi* as well.

Aeronautes saxatalis sclateri. White-throated Swift. Twelve specimens: Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 27, 1950; Merkley Park, 8 mi. N. Vernal, June 30, 1950. These were taken along sandstone cliffs where they were nesting. The collector (Selander) observed a few pairs copulating in flight. The testes were enlarged to an average length of 14 mm. while the

small size and general condition of the ovaries suggested that nesting had begun some time before. The measurements of these series agree closely with those reported by Twomey (*op. cit.*:403). Ghiselin saw a pair on the north side of the pass between Rock Creek and the east fork of the Bear River at 11,500 feet, Summit County, September 4, 1955.

Selasphorus platycercus platycercus. Broad-tailed Hummingbird. Two specimens: Lake Fork Cr., 6000 feet, near Mt. Emmons, Duchesne County, August 4, 1934; Gatman Lake, 10,400 feet, Naturalist Basin, 1 1/2 mi. SE. Mt. Agassiz, July 29, 1955. In addition we have 17 records for the western Uintas from June 30 to September 4, mostly of female or immature birds. Three were of birds above 11,200 feet, which is well above timberline, but the species was most abundant around talus slopes and hillsides below timberline where the birds fed at brightly colored alpine flowers such as paintbrush and thistles. Twomey (*op. cit.*:405) found this species nesting between 6000 and 8000 feet in pygmy forest and aspen communities.

Selasphorus rufus. Rufous Hummingbird. Three specimens: 3 mi. NW. Strawberry Reservoir, July 15, 1934; Lake Fork Cr., 6000 feet, near Mt. Emmons, August 4, 1934. Twomey (*op cit.*:405) noted that the southward migration began on July 20. Our specimens were taken in willows.

Megaceryle alcyon caurina. Belted Kingfisher. One specimen: 3 mi. up Brown Duck Canyon, NW. Moon Lake, 9000 feet, Duchesne County, September 2, 1948. This was a female taken at a beaver pond.

Colaptes cafer collaris. Red-shafted Flicker. Three specimens, all taken in cottonwoods: White's Basin, 7500 feet, 5 mi. NE. Oakley, October 29, 1944; 12 mi. E. Oakley, 7500 feet, July 20, 1950; Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 28, 1950. In addition we have 27 sight records for the western Uintas from July 20 to September 6. The failure to observe the species at higher elevations before late July suggests that it does not breed there. Although the flicker was most often seen in the spruce-fir forest and sometimes in lodgepole pine, it occasionally appeared in meadows. Flocks of 3 or 4 birds, presumably family groups, were often noticed. A note on the one specimen showing evidence of hybridization with *C. auratus* is given by Behle and Selander (1952:28).

Dryocopus pileatus picinus. Pileated Woodpecker. A lone bird was seen by Ghiselin on August 14, 1954 flying above the coniferous forest 3/4 miles north of Grandaddy Lake, 10,300 feet, Duchesne County. Woodbury, Cottam and Sugden (1949:19) note "an observation in Uinta Mountains among yellow pine, August 10, 1943." This probably refers to a report of Rex Snow who saw three on this date near the Davis Ranch on the Uinta River, about 30 miles north of Roosevelt. The birds flew from some yellow pines to a patch of willows along the stream and then back to the pine forest. Twomey did not encounter the species.

Sphyrapicus varius nuchalis. Yellow-bellied Sapsucker. Eleven specimens: Smith-Morehouse Creek, 7100 feet, October 10, 1931 and May 28-30, 1932; 12 mi. E. Oakley, 7500 feet, May 28, 1950; 3 mi. NW. Strawberry Reservoir, 7700 feet, July 15, 1934; Merkley Park, 10 mi. N. Vernal, June 21, 1949; 3 mi. S. Vernal, 5200 feet, September 10, 1948; Spirit Lake, July 10, 1956. Mostly the species was taken in aspens, but at Merkley Park it occurred in cottonwoods.

Sphyrapicus thyroideus nataliae. Williamson's Sapsucker. One specimen: Mirror Lake, 10,000 feet, September 22, 1932.

Dendrocopos villosus monticola. Hairy Woodpecker. Six specimens: Smith-Morehouse Canyon, 8500 feet, October 8, 1932; Mirror Lake, 10,500 feet, September 22, 1932; W. Slope Murdock Mt., 10,900 feet, 1 1/2 mi. SW. Mirror Lake, July 29, 1953; Naturalist Basin, 10,400 feet, August 23, 1954; 2 1/2 mi. E. Scudder Lake, 10,200 feet, Duchesne County, August 21, 1954; Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 28, 1950. All were taken in the spruce-fir forest except the one from Dry Fork Canyon which was taken in a grove of cottonwoods. In addition we have 11 sight records for the western Uintas only two of which were above 10,500 feet. Here this woodpecker showed a preference for denser forests than attracted the three toed woodpecker. Twomey (*op. cit.*:409) stated that the species showed a preference for nesting sites in the higher altitude communities, from 7000 to 9000 feet in scattered yellow pine, alpine fir, aspen and Douglas fir forests.

Dendrocopos pubescens leucurus. Downy Woodpecker. Three specimens: Smith-Morehouse Cr., 7100-8000 feet, October 10, 1931 and May 27, 1950; Soapstone, Wasatch County, 8500 feet, September 23, 1932.

Picoides tridactylus dorsalis. Northern Three-toed Woodpecker. Eight specimens: Summit near Mirror Lake [=Bald Mt. Pass], 10,500 feet, September 23, 1932; 1 1/2 mi. S. Mt. Agassiz, 10,100 feet Duchesne County, August 17, 1955; Lake Fork Mt., 10,000 feet, 32 mi. N. Duchesne, June 18, 1950; Spirit Lake, July 6-10, 1956. Hayward (1945:68) states that the species was apparently confined to the Upper Montane. Twomey (*op. cit.*:409) reports it in both lodgepole pine and Engelmann spruce. The species was observed 16 times in and near the Naturalist Basin and found to be about five times as frequent on spruce trees or in areas of spruce-fir forest as it was in lodgepole pine. Ordinarily the birds were seen singly feeding on dead trees at any height.

Tyrannus tyrannus. Eastern Kingbird. Two specimens: 3 mi. SW. Jensen, July 27 and August 11, 1949. These were taken in fields. An unusual place of occurrence for this species was in a lodgepole pine with aspens nearby at the Bear River Forest Camp, 8300 feet, Summit County, on September 6, 1955.

Sayornis saya saya. Say's Phoebe. One specimen: Brush Cr., 4500 feet, 8 mi. NE. Vernal, August 24, 1949.

Empidonax traillii adastus. Traill's Flycatcher. Six specimens: Chalk Cr., 5 mi. E. Coalville, June 15, 1949; Duchesne, June 20,

1949; Brush Creek, 8 mi. NE. Vernal, August 24, 1949; Merkley Park, 10 mi. N Vernal, June 22, 1949; Birch Cr., 7500 feet, 3 1/2 mi. S. Utah-Wyoming border, July 11, 1956. In every case they were taken in willows. Twomey (*op. cit.*: 412) referred his specimens to *adastus* but Snyder (1953:7) referred specimens from northeastern Utah to *extimus*. Our specimens were submitted to John W. Aldrich, who finds them to be intergradational between the two races, but most of them closest to *adastus*.

Empidonax hammondii. Hammond's Flycatcher. Five specimens: Smith-Morehouse Co., 7100 feet, May 30, 1932 and May 30, 1934; 17 mi. E. Kamas, Summit County, May 31, 1953; 12 mi. E. Oakley, May 26, 1950. Our specimens were taken in aspen and lodgepole pine.

Empidonax oberholseri. Dusky Flycatcher. Four specimens: Nobletts R.S., 7600 feet, 10 mi. SE. Kamas, June 26, 1946; 1 mi. N. Nobletts R.S., July 2, 1946; Timothy Cr., 7500 feet, 10 mi. N. Altonah, Duchesne County, June 25, 1950; Spirit Lake, 10,600 feet, July 10, 1956. They were taken in aspen-spruce-fir forest.

Contopus sordidulus veliei. Western Wood Peewee. Seven specimens: 3 mi. NW. Strawberry Reservoir, July 15, 1934; Arcadia, 14 mi. NE. Duchesne, September 5, 1949; Paradise Park, 10,000 feet, July 28, 1953; 3 mi. S. Vernal, August 27, 1949; Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 29, 1950; Kabell Spring, 8500 feet, 25 mi. N. Vernal, July 16, 1946. They were taken in cottonwoods, willows, aspen and lodgepole pine. In addition we saw the species at Grandaddy Lake, 10,400 feet, Duchesne County, on August 2, 1955.

Nuttallornis borealis. Olive-sided Flycatcher. Four specimens: Naturalist Basin, 10,400 feet, August 22, 1954 and July 21, 1955; Spirit Lake, 10,600 feet, July 8, 1956. They were all taken in spruce-fir forest. In addition we have five sight records for Naturalist Basin, all in areas of spruce-fir forest. Twomey (*op. cit.*:414) found the species nesting in spruce-fir forest at Paradise Park, 10,500 feet. Hayward (1931:151) considered the species to be a common nesting bird and later (1945:112) stated that it occurred in both seral and climax stages of the montane forest.

Eremophila alpestris leucolaema. Horned Lark. Eleven specimens: Kennedy Station, 8 mi. NW. Bonanza, August 30, 1953; Roosevelt, February 6 and 20, 1956; Myton, February 20, 1956; 10 mi. S. Myton, April 23, 1938.

Tachycineta thalassina lepida. Violet-green Swallow. Twomey (*op. cit.*:415) states that this swallow nests in the mountains from 6000 to 8000 feet. Hayward (1945:68, 112) found the species to be confined to the aspen subclimax of the lower montane. We have only one definite sight record for the high mountains at Leconte Lake, 11,000 feet, Naturalist Basin, July 16, 1955. Another observation was of a flock of about 150 at Shingle Creek, 7500 feet, Summit County, near Kamas on August 16, 1954.

Stelgidopteryx ruficollis serripennis. Rough-winged Swallow. Two specimens: Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal,

June 29, 1950. Both were foraging over a meadow.

Hirundo rustica erythrogaster. Barn Swallow. One specimen. 3 mi. SW. Jensen, August 31, 1949.

Petrochelidon pyrrhonota pyrrhonota. Cliff Swallow. Fifteen specimens: Peoa, May 30, 1934; 12 mi. E. Oakley, July 24, 1950; Roosevelt, June 30, 1950; Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 30, 1950. At the time of the review of the Utah races by Behle (1948:73) the systematic status of the cliff swallows of the Uinta Basin was obscure. The material obtained since then indicates another highly variable population in the basin particularly as regards size. They appear closest to *pyrrhonota* but are intergradational with *hypopolia.*

Perisoreus canadensis capitalis. Gray Jay. Twenty-six specimens: Smith-Morehouse Cr. and Weber R., 7100 feet, October 11, 1931; Mirror Lake, September 22, 1932 and October 8, 1938; Paradise Park, July 28, 1953; Head Ashley Cr., 9000 feet, nr. Trout Cr. Park, 20 mi. N. Vernal, September 4, 1949; Spirit Lake, July 6-10, 1956. This is an abundant resident. We have in addition 56 sight records for the high western Uinta Mountains but none above timberline. As Twomey (*op. cit.*:417) states, they are restricted to the high spruce-fir forests around 10,000 feet showing little altitudinal migration. They are gregarious, rarely being seen alone.

Cyanocitta stelleri macrolopha. Steller's Jay. Eleven specimens: Smith-Morehouse Cr., October 10-11, 1931; 17 mi. E. Oakley, 7500 feet, May 27, 1950; Stockmore, October 17, 1931; 3 mi. S. Moon Lake, 8400 feet, September 2, 1948; Timothy Cr., 10 mi. N. Altonah, June 24-July 24, 1950. The two examples from Smith-Morehouse Creek are intermediates toward *annectans.*

Aphelocoma coerulescens woodhousei. Scrub Jay. Two specimens: Hideout Canyon, 5500 feet, 7 mi. SE. Manila, September 12, 1950.

Pica pica hudsonia. Black-billed Magpie. One specimen: Peoa, October 16, 1931.

Gymnorhinus cyanocephala. Piñon Jay. Seven specimens: Timothy Cr., 7500 feet, 10 mi. N. Altonah, June 23-24, 1950; 18 mi. N. Vernal, 7000 feet, July 17, 1946; 3 mi. S. Vernal, July 26, 1948 and August 6, 1949. Timothy Creek specimens were immatures, taken in yellow pine. One taken in cottonwoods in July, 3 miles south of Vernal, doubtless was a postbreeding season wanderer.

Nucifraga columbiana. Clark's Nutcracker. One specimen: Bald Mt., 3 mi. SE. Wall L., 10,500 feet, July 22, 1935. Hayward (1952: 116) found the species in krummholz and earlier (1945:71) stated that it prefers scattered subclimax types of forests. Twomey (*op. cit.*:421) found the species rather scarce in the mountains bordering the basin. We have 12 sight records for the Naturalist Basin area where it is an uncommon resident. The species occurred about twice as frequently above timberline, or in areas of sparse and scrubby tree growth just below timberline, as in the coniferous

forest. The species was gregarious, nearly always occurring in small flocks.

Parus atricapillus garrinus. Black-capped Chickadee. Several localities in the Uinta Basin from which specimens of this race were available were listed by Behle (1951:76) at the time he described the race. The type locality is Merkley Park, 5500 feet, Ashley Canyon, 10 miles north of Vernal. Specimens representing this race total 12. Not heretofore listed are one from the Vernal Refuge, 3 miles south of Vernal, August 26, 1949, and one from Brush Creek, 8 miles northeast of Vernal, August 24, 1949. It now appears that *garrinus* reaches the western limit of its range in the eastern part of the Uinta Basin and then intergrades westward with *nevadensis.* Examples from the western portion of the basin are closest to the latter race.

Parus atricapillus nevadensis. Black-capped Chickadee. Specimens from 12 miles east of Oakley were earlier listed under *nevadensis* (Behle, *op. cit.*:76). Another series taken since, 1 mile east of Duchesne, November 19, 1950, is also referable to *nevadensis.* Total specimens, 11.

Parus gambeli wasatchensis. Mountain Chickadee. Several of the specimens from the area were listed by Behle when he described the race *wasatchensis* (1950:273) and in his systematic review of the species (1956:67). Other unrecorded specimens are as follows: 10-17 mi. E. Oakley, 7200-8000 feet, May 27-29, 1950; 22 mi. E. Kamas, 8300 feet, May 30, 1953; 1 1/2 mi. E. and 2 mi. W. Hayden Peak, 10,000 feet, June 24, 1953; Lake Fork Mt., 10,000 feet, 32 mi. N. Duchesne, June 20-21, 1950; Timothy Cr., 7500 feet, 10 mi. N. Altonah, June 23, 1950; Paradise Park, 10,000 feet, July 29, 1953; Spirit Lake, July 8-10, 1956. Total specimens, 29.

Hayward (1952) does not record this species in alpine situations but Twomey (*op. cit.*:422) notes that it nests from 8000 feet to timberline. This chickadee is a common summer resident of the high Uintas, there being 47 sight records. Only three were above timberline, and all of these were near some coniferous growth. The species was most frequently found in small flocks of 2 to 5.

Sitta carolinesis nelsoni. White-breasted Nuthatch. Eleven specimens: Timothy Cr., 7500 feet, 10 mi. N. Altonah, June 23-24, 1950; Kabell Spring, 8500 feet, 25 mi. N. Vernal on State Highway 44, July 16, 1946. One was taken in an aspen, the remainder in yellow pine. Twomey (*op. cit.*:422), concluding that his specimens were of a new race, described *Sitta carolinensis uintaensis* with type locality at Green Lake, 40 miles north of Vernal. However, in his review of the species, Aldrich (1944:598) did not recognize the race and referred the Uinta population to *nelsoni.*

Sitta canadensis. Red-breasted Nuthatch. Three specimens: Cobblerest, Summit County, September 24, 1932; Lake Fork Mountain, 10,000 feet, 32 mi. N. Duchesne, June 21, 1950; Smith-Morehouse Cr., May 28, 1932. Hayward (1945:68, 113) reports it only in the lower montane climax. We have one sight record for Natural-

ist Basin, near Morat Lake, 10,400 feet, August 16, 1952 in the spruce-fir forest. Twomey (*op. cit.*:424) took specimens at Green Lake and Moon Lake.

Certhia familiaris montana. Brown Creeper. Six specimens: Naturalist Basin, 10,400 feet, August 23, 1954; Lake Fork Mt., 10,000 feet, 32 mi. N. Duchesne, June 19, 1950; Head Ashley Cr., 9000 feet, nr. Trout Creek Park, 20 mi. NW. Vernal, September 4, 1949; Spirit Lake, July 9, 1956. In addition we have 11 sight records for the Naturalist Basin region, all from areas of coniferous timber, a habitat where it was also found by Hayward (1945:113) and Twomey (*op. cit.*:424). It is a sparse resident in the Uinta Mountains.

Cinclus mexicanus unicolor. Dipper. Two specimens: Smith-Morehouse Cr., October 10, 1931; 3 mi. up Brown Duck Canyon, NW. Moon L., 9000 feet, September 2, 1948. We have also 28 sight records for the Naturalist Basin area. They were usually seen singly, rarely in pairs. All but one were at streamsides One observation of an ouzel in an apline meadow indicates that occasionally, although rarely, individuals may wander from streams. Another was seen along a stream between two lakes; the upper lake is spring-fed and the lower had no outlet at the time.

Troglodytes aedon parkmanii. House Wren. Three specimens 1 mi. N. Nobletts R. S., 7600 feet, 11 mi. SE Kamas, July 4, 1946; Smith-Morehouse Cr., May 30, 1932; 4 mi. up Brown Duck Canyon, 9000 feet, NW. Moon Lake, September 2, 1948. As Twomey (*op. cit.*:425) noted, they were common in canyon thickets from the lowland nearly to timberline.

Catherpes mexicanus conspersus. Cañon Wren. One specimen: Winn Ranch, near junction Argyle Canyon and Minnie Maud Cr., 25 mi. S. Duchesne, April 23, 1938.

Salpinctes obsoletus obsoletus. Rock Wren. Four specimens: 1/2 mi. SE. Ryder Lake, 10,700 feet, head Stillwater Fork of Bear River, Summit County, September 5, 1955; Naturalist Basin, 11,300 feet, August 23, 1954; 2 mi. S. White R., 30 mi. S. Jensen, August 31, 1953. Hayward (1952:115) reports that the species breeds consistently in the alpine area and that it occurs in seral stages of the upper montane climax. We have 28 sight records for the Naturalist Basin area all above timberline. Their greatest abundance is around talus.

Dumetella carolinensis. Catbird. Three specimens taken in willows: 3 mi. S. Vernal, July 9, 1949; Merkley Park, 10 mi. N. Vernal, June 21, 1949.

Oreoscoptes montanus. Sage Thrasher. One specimen: Lake Fork Cr., 6000 feet, nr. Mt. Emmons, Duchesne County, August 4, 1934.

Turdus migratorius propinquus. Robin. Four specimens: 22 mi. E. Kamas, May 30, 1953; Stockmore, October 18, 1931; 3 mi. S. Moon Lake, 8400 feet, September 3, 1948; Jesson Lake [nr. Spirit Lake], July 9, 1956. This is an abundant summer resident. We have 63 sight records for the Naturalist Basin area. Although

they are essentially birds of the coniferous forests, robins frequently feed in meadows. Hayward (1952:116) found the species in krummholz. Eight of our records are from above timberline, but 3 of these were near areas of coniferous scrub. Flocks of as many as 18 robins were seen in late August.

Hylocichla guttata guttata. Hermit Thrush. One specimen: Smith-Morehouse Cr., October 11, 1931. This is an uncommon transient through the state.

Hylocichla guttata auduboni. Hermit Thrush. Thirty specimens: Smith-Morehouse Cr., October 11, 1931 and May 28, 1932; Bald Mt. Pass, 2 1/2 mi. S. Mirror Lake, 10,600 feet, June 22, 1953; Timothy Cr., 7500 feet, 10 mi. N. Altonah, June 23, 1950; Lake Fork Mt., 10,000 feet, 32 mi. N. Duchesne, June 17-18, 1950; Paradise Park, 10,000 feet, July 27, 1953; Head Ashley Cr., 9000 feet, nr. Trout Creek Park, 20 mi. NW. Vernal, September 4, 1949; Spirit Lake, July 6-9, 1956. Breeding birds were taken in spruce-fir, aspen, and lodgepole pine forests. We have 11 sight records for the Naturalist Basin region, all below timberline and mostly in dense timber. Hayward (1952:116) reports the species in krummholz. Twomey (*op. cit.*:430) found it commonest during the nesting season in the Engelmann spruce-alpine fir forest. Hermit thrushes were almost always seen alone; our only record of a group is of three immatures on August 7, 1955, with no attendant adult evident.

Hylocichla ustulata swainsoni. Swainson's Thrush. Eight specimens: Chalk Cr., 6500 feet, nr. Pinecliff, 18 mi. E. Coalville, June 15, 1949; Oakley, May 29, 1950; 12 mi. E. Oakley, May 28 and July 20, 1950; Nobletts R. S., 7600 feet, 10 mi. SE. Kamas, June 27, 1946; Lake Fork Mt. 10,000 feet, 32 mi. N. Duchesne, June 18, 1950. Twomey (*op. cit.*:431) had only one specimen and did not observe the species in the Uintas in 1937; Hayward (1945:68) states that the distribution of the species is uncertain. We found this thrush to be fairly common. Our specimens were taken in willows along streams, lodgepole pines and spruce-fir forest. There are 5 records for the higher mountains all in dense forest. Thus both the Hermit and Swainson thrushes occur in coniferous forest, but only the latter in willows. We detected little difference in the habits of the two species.

Sialia currucoides. Mountain Bluebird. Four specimens: Kamas, September 21, 1932; Walcott Lake, 11,000 feet, Naturalist Basin, July 27, 1955; Bald Mt. Pass, 10,700 feet, June 22, 1953; 4 mi. SE. Hanna, July 20, 1947. We have 19 sight records for the high mountains, all above timberline. Single bluebirds or small flocks frequently appeared on the tundra and in the alpine meadows after the third week in July. Ghiselin's earliest record is July 12, in 1953; in 1955 the first record was July 23. There was no evidence of nesting in Naturalist Basin, although the specimen from Walcott Lake, taken on July 27, was an immature bird. Hayward (1945:113) found the species in both seral and climax stages of the upper montane, adding (*op. cit.*:69) that it nests in trees or

shrubs. The species was found by Twomey (*op. cit.*:431) to be most abundant from 8000 to 10,000 feet. Considering the comparative frequency of occurrence of the species in Naturalist Basin, and in the light of the findings of Hayward and Twomey, Ghiselin's not finding the bird below timberline is interesting. This indicates a pronounced upward, postbreeding season movement and orientation to open country, followed by descent to the basin in migration (see Twomey, *loc. cit.*).

Myadestes townsendi townsendi. Townsend's Solitaire. Six specimens: White's Basin, 7500 feet, 5 mi. NE. Oakley, October 29, 1944; Stockmore, October 18, 1931; 25 mi. N. Vernal, 8500 feet, July 15, 1946; Spirit Lake, July 10, 1956. There are only two sight records for Naturalist Basin, one on June 29, 1955, the other on August 4, 1955, both in areas of spruce-fir forest. Hayward (1945: 113) found the species in coniferous forest and krummholz (1952:116). Twomey (*op. cit.*:432) reports a family group at Bald Mountain on July 17, 1937. On October 3, 1953 Ghiselin observed a flock of 15 at Yellow Pine Forest Camp along the Provo River east of Kamas.

Regulus satrapa olivaceus. Golden-crowned Kinglet. One specimen taken in spruces: Mouth Brown Duck Canyon, nr. Moon Lake, 8500 feet, September 2, 1948, earlier reported by Behle and Selander (1952:29). Twomey (1942) did not find this species.

Regulus calendula cineraceus. Ruby-crowned Kinglet. Twelve specimens: Smith-Morehouse Cr., October 10, 1931 and May 30, 1932; 22 mi. E. Kamas, 8500 feet, May 30, 1953; 20 mi. S. Myton, 5900 feet, April 24, 1938; Hacking Lake, 10,500 feet, 15 mi. NW. Vernal, August 14, 1949; Head Ashley Cr., 9000 feet, nr. Trout Creek Park, 20 mi. NW. Vernal, September 4, 1949; Spirit Lake, July 6-9, 1956. There are 16 sight records for the Naturalist Basin area. The earliest of these is July 20 which implies that these kinglets do not breed at high altitudes, but rather enter upper montane habitats as postbreeding wanderers. Both Twomey (*op. cit.*:433) and Hayward (1945:67) list it as breeding in spruce-fir forests; the latter has noted the species in krummholz (1952:116). Family groups of 4 to 6 were often seen in late summer. All specimens were taken in spruces or lodgepole pine save that from south of Myton, which occurred in piñon-juniper forest.

Anthus spinoletta alticola. Water Pipit. Thirty-seven specimens: Mirror Lake, July 13, 1935; N. slope Murdock Mt., 11,000 feet, 1 1/2 mi. S. Mirror Lake, June 23, 1953; E. slope Murdock Mt., 11,200 feet, July 21, 1953; W. base Hayden Peak, 11,000 feet, June 29, 1953; S. slope Bald Mt., 11,500 feet, 3 mi. E. Wall Lake, September 21, 1953; Naturalist Basin, 10,400 feet, August 23, 1954; 5 mi. S. Moon Lake, 8000 feet, September 3, 1948; Lake Fork Mt., 10,000 feet, 32 mi N. Duchesne, June 17-19, 1950; Paradise Park, 10,000 feet, July 28, 1953; Hacking Lake, 10,500 feet, 15 mi. NW. Vernal, August 14, 1949; East Park, 20 mi. N. Vernal August 21, 1949; Spirit Lake, July 6-8, 1956. We have also 71 sight

records for the Naturalist Basin area, so that species is an abundant summer resident.

The pipit is exclusively a bird of open country, and in our experience occupies two ecological situations in the alpine and subalpine environment. One is an extensive grassy or sedgy place in the coniferous belt. This corroborates Hayward's report (1952: 115) that it nests in open parks in coniferous woods. In such a habitat pipits were common at Spirit Lake. Eleven of the Naturalist Basin sight records were in meadows below timberline. The other situation is dry, rocky, tundra above timberline. Here it is at once the most adundant and the most conspicuous bird.

Two pipit nests were discovered in Naturalist Basin in 1955, both above timberline. They were found on June 27 and July 2, both then containing five eggs. Both nests were made of grasses and were under the projecting edges of low, flat stones. Both were near a small stream bed, at the center of a swale which dried up about the first week of July; but it seems probably that it was a flowing sream at the time the nests were built. This placement of nesting sites conforms to the statement of Twomey (*op. cit.*: 434) that a prerequisite for nesting was the sloping shore of a lake or stream where the nests were built under the edge of a stone or sod clump, which was the situation of our two nests. Hayward (1941:5), however, reports finding a nest, which was in the open on a rather dry subalpine meadow. After the breeding season family groups are common; ultimately they blend into sizable flocks.

Lanius excubitor invictus. Northern Shrike. One specimen: Myton, November 18, 1950. Twomey did not report this species.

Sturnus vulgaris vulgaris. Starling. An extensive account of starlings wintering in the Uinta Basin has been presented by Killpack and Crittenden (1952).

Vireo solitarius plumbeus. Solitary Vireo. Three specimens: Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 27-29, 1950. These were reported by Behle and Selander (1952:30).

Vireo gilvus leucopolius. Warbling Vireo. Twelve specimens: Smith-Morehouse Cr., May 30, 1932; Nobletts R. S., 7600 feet, 10 mi. SE. Kamas, June 27, 1946; 3 mi. NW. Strawberry Reservior, July 15, 1934; Arcadia, 14 mi. NE. Duchesne, September 3, 1949. Timothy Cr., 7500 feet, 10 mi. N. Altonah, June 24, 1950; Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 27-29, 1950; Birch Cr., July 11, 1956. These were taken in cottonwoods and aspens

Vermivora celata orestera. Orange-crowned Warbler. Two specimens: Naturalist Basin, 11,300 feet, August 23, 1954, and 10,400 feet, July 29, 1955. The July specimen was an immature male taken in the spruce-fir forest, while the August example occurred on the alpine tundra. The species is a sparse summer resident of the Naturalist Basin area, occurring at altitudes from 10,300 feet to 11,300 feet. We have eleven sight records. Most were seen in spruce-fir forest but one was found in herbaceous streamside vegetation and two in areas of scrub conifers. Hayward (1945:

113) lists the species as occurring in the climax of the Upper Montane. The species was taken at Green Lake, 8000 feet, by Towney (*op. cit.*:438).

Vermivora celata celata. Orange-crowned Warbler. One specimen: Arcadia, 5000 feet, 14 mi. NE. Duchesne, September 3, 1949. This immature migrant taken in willows was previously reported by Behle and Selander (*op. cit.*:30).

Dendroica petechia morcomi. Yellow Warbler. Sixteen specimens: Current Cr., 7 1/2 mi. N. U.S. Highway 40, Wasatch County, July 10, 1946; Merkley Park, 6000 feet, 10 mi. N. Vernal, June 21, 1949; Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 27-29, 1950; Brush Cr., 4500 feet, 8 mi. NE. Vernal, August 24, 1949; 3 mi. SW. Jensen, August 23, 1949; Birch Cr., July 11, 1956. Specimens were taken in cottonwoods, willows and dogwood along streams.

Dendroica auduboni memorabilis. Audubon's Warbler. Nine specimens: Mirror Lake, 10,000 feet, July 13, 1935; 2 mi. S. Bald Mt., 10,500 feet, June 15, 1953; 22 mi. E. Kamas, 8,500 feet, June 13, 1953; Lake Fork Mt., 10,000 feet, 32 mi. N. Duchesne, June 21, 1950; Spirit Lake, July 7-10, 1956. We have 35 sight records for the Naturalist Basin region, none of them above timberline. This warbler is a common summer resident of the spruce-fir forest, but despite its preference for timbered areas it is not restricted to the climax of the forest. It showed an attraction for parklike areas, although it occurred in the trees there. Hayward (1945:72) states that it is confined chiefly to the tree layer. Until about mid-August mostly single individuals were noted, but by early September flocks of immature birds were found, often near timberline but occasionally at lower elevations. On September 5, 1955 a mixed flock of Audubon warblers, gray-headed juncos and white-crowned sparrows was observed at 10,700 feet near Ryder Lake at the head of the Stillwater Fork of the Bear River in talus and adjacent spruce-fir vegetation.

Dendroica townsendi. Townsend's Warbler. We have two sight records of this transient. One was seen at Moon Lake on September 2, 1949 by Vern Bullough, and another 1 1/2 miles east of Scudder Lake, 10,100 feet, by Ghiselin on August 16, 1954. Both occurred in spruce cover.

Oporornis tolmiei monticola. MacGillivray's Warbler. Six specimens: Oakley, May 24, 1950; 12 mi. E. Oakley, 7500 feet, July 20, 1950; 3 mi. S. Vernal, August 27, 1949.

Geothlypis trichas occidentalis. Yellowthroat. Two specimens: Arcadia, 14 mi. NE. Duchesne, September 3, 1949. Both were immatures, probably migrants, taken in willows.

Icteria virens auricollis. Yellow-breasted Chat. Three sepcimens: Merkley Park, 10 mi. N. Vernal, June 21, 1949; Brush Cr., 4500 feet, 8 mi. NE. Vernal, August 24, 1949. They were taken in willows, rose and cottonwoods.

Wilsonia pusilla pileolata. Wilson's Warbler. Nineteen specimens: 1/4 mi. SW. Morat Lake. 10,450 feet, Naturalist Basin, August 9. 1955; Arcadia, 14 mi. NE. Duchesne, September 3. 1949; 3 mi. S. Vernal, September 10, 1948; Spirit Lake, July 7-10, 1956. In addition we have seven sight records for the Naturalist Basin area all in August. Three records were of pairs, the remainder of single birds. Most were found in spruce-fir forest. These data suggest that in Naturalist Basin the species is a transient or postbreeding wanderer. Twomey (*op. cit.*:449), however, found the species nesting in shrubby growth, principally willows, along swift mountain streams. We also found the species nesting in the Spirit Lake area. Here pileolated warblers were abundant in willows at the edges of lakes and along streams. Fledglings were seen during the second week in July.

Setophaga ruticilla tricolora. American Redstart. Two specimens: Arcadia, 14 mi. NE. Duchesne. September 3, 1949; Merkley Park, 10 mi. N. Vernal, June 21. 1949. These records were cited by Behle and Selander (1952:30-31), as well as sight records from Hideout Canyon, September 12, 1950.

Agelaius phoeniceus utahensis. Redwinged Blackbird. Fourteen specimens: Oakley. May 29, 1954; Fort Duchesne, June 30, 1950; Birch Cr., July 11, 1956.

Euphagus cyanocephalus. Brewer's Blackbird. Two specimens: Birch Cr., July 11, 1956.

Molothrus ater artemisiae. Brown-headed Cowbird. Two specimens: Arcadia, July 3, 1950; Birch Cr., July 11, 1956.

Piranga ludoviciana. Western Tanager. According to Twomey (*op. cit.*:456) this species was numerous during the breeding season from 7500 to 10,000 feet in several communities. Hayward (1945:113) lists it as occurring only in the lower montane communities. We have only one sight record for high Uintas; a single adult male was seen at Boundary Creek. 10,200 feet, Summit County. September 2. 1955, in a spruce-fir-lodgepole pine forest. At this elevation it would appear to be a casual postbreeding wanderer.

Pheucticus melanocephalus melanocephalus. Black-headed Grosbeak. One specimen: Mt. Emmons along Lake Fork Cr., 6000 feet, August 4, 1934.

Guiraca caerulea. Blue Brosbeak. One specimen, reported by Behle and Selander (*op. cit.*:31), was taken at the Upland Game Bird Refuge, 3 miles south of Vernal in June, 1950. This species was not found by Twomey.

Passerina amoena. Lazuli Bunting. One specimen taken in a cottonwood: Currant Cr., 7700 feet. 7 1/2 mi. N. U.S. Highway 40, Wasatch County, July 10, 1946.

Carpodacus cassinii. Cassin's Finch. Fifteen specimens: White's Basin, 7500 feet, 5 mi. NE. Oakley, October 21. 1944; 22 mi. E. Kamas, 8500 feet, June 13. 1953; Bald Mt. Pass, 10,700 feet, 2 mi. SW. Mirror Lake. June 24, 1953; S. base Bald Mt., 10,800 feet, 1 1/2 mi. SW. Mirror Lake, July 13, 1953; 1 mi. SW. Mirror Lake,

10,500 feet, June 30, 1953; Paradise Park, 10,050 feet, 7 mi. SW. Marsh Pk, July 21, 1947; 25 mi. N. Vernal, 8500 feet, July 15, 1946; Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 29, 1950; Spirit Lake, July 6-10. 1956. The species was common at many locations, but not in the Naturalist Basin area where only three definite sight records were obtained, on July 16 and August 17, 1952 and July 12, 1953.

Carpodacus mexicanus frontalis. House Finch. Two specimens: Brush Cr., 4500 feet, 8 mi. SE. Vernal, August 24, 1949; Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 29, 1950. The latter was taken in juniper forest.

Pinicola enucleator montana. Pine Grosbeak. Thirty-eight specimens: Bald Mountain-Mirror Lake area, 10,500-10,800 feet June 15-July 13, 1953; Naturalist Basin, September 11, 1956; Fish Hatchery Lake, 10,300 feet, 10 mi. N. Hanna, Duchesne County, July 24, 1946; Lake Fork Mt., 10,000 feet, 32 mi. N. Duchesne, June 17-21, 1950; Paradise Park, 10,000 feet, July 28, 1953; Spirit Lake, July 6-11, 1956. This was a fairly common resident in the higher coniferous belt. We have 36 sight records for the Naturalist Basin region. Although they often feed on the ground near trees, pine grosbeaks were not found outside the forested areas. They occurred in both Engelmann spruce and lodgepole pine. Hayward (1952: 116), however, reports them in krummholz. Some attention was paid to the comparative frequency of occurrence of the color phases in the Naturalist Basin population. In 15 observations of single birds or groups the red and yellow phases were about equally common and blotched birds, having both red and yellow feathers in noticeable degree in the plumage, comprised from 10 to 15 per cent of the summer population. Notes on gular sacs and breeding activities in the Mirror Lake area have been given by French (1945b:83-85).

Leucosticte atrata. Black Rosy Finch. Twenty-six specimens: Dean Lake, 1 1/4 mi. NE. Wall Lake, 10,400 feet, Summit County, July 22, 1953; S. slope Bald Mt., 3 mi. E. Wall Lake, 11,500 feet, July 25 and September 21, 1953; W. slope Murdock Mt., 11,000 feet, 1 1/2 mi. S. Mirror Lake, Duchesne County, July 20-29, 1953; 1 mi. SE. Spirit Lake, July 8, 1956. In addition we have 27 sight records for the Naturalist Basin region, none of them below timberline. They occurred on both rocky areas and tundra, preferring cliffs during the breeding season. Flocks larger than family groups were not noted before mid-July, but thereafter the sizes of the flocks increased; one numbering about 150 was seen on August 23, 1954.

Acanthis flammea flammea. Common Redpoll. One was seen at Roosevelt on December 28, 1956 by Killpack (see Audubon Field Notes, 11(3) June, 1957:285).

Spinus pinus pinus. Pine Siskin. Twenty-nine specimens: Nobletts R. S., 7600 feet, 10 mi. SE. Kamas, Wasatch County, June 26, 1946; E. base Notch Mt., 10,500 feet, 1 1/2 mi. NE. Wall Lake, Summit County, July 22, 1953; Bald Mt.-Mirror Lake area, 10,-

500 feet, June 16-28, 1953; Naturalist Basin, 10,400 feet, August 22, 1954; Paradise Park, 10,050 feet, July 21, 1947; Spirit Lake, July 7-10, 1956. We have 16 sight records for the Naturalist Basin region from mid-July to early September. The siskins seems confined essentially to coniferous forest, although it may feed on such herbs as *Mertensia* in talus slopes near conifers.

Spinus tristis pallidus. American Goldfinch. Three specimens: Currant Cr., 7700 feet, 7 1/2 mi. N. U.S. Highway 40, Wasatch County, July 10, 1946; 3 mi. SW. Jensen. August 28, 1949.

Loxia curvirostra benti. Red Crossbill. Eighteen specimens: 1 1/2 mi. SW. Mirror Lake, 10,600 feet, June 22, 1953; W. slope Murdock Mt., 10,900 feet, July 29, 1953; 2 mi. S. Bald Mt., June 15-30. 1953; SW. base Bald Mt., 10,700 feet, 3 mi. E. Wall Lake, July 24, 1953; 2 mi. E. Wall Lake, 10,500 feet, July 22, 1953; Spirit Lake, July 5-10, 1956. Ghiselin found the species uncommon in Naturalist Basin. His one definite record was in scattered spruce-fir forest on August 12, 1955. Crossbills are fairely common in the Mirror Lake-Bald Mountain area. Juveniles were taken on July 22 Hayward (1931:152) reported large flocks and later (1945:114) indicated that the species occurred in climax stages of the upper montane forest.

The large series of 23 specimens from Green Lake and Bald Mountain taken by Twomey (*op. cit.*:464) was referred to *benti* although 9 showed characteristics of *grinnelli*. A series of 22 in the Zoology Museum of Brigham Young University is also referable to *benti* (Hayward, 1943:276), although some show characters of *bendirei*. The birds listed above likewise are closest to *benti* although a variable lot.

Loxia curvirostra bendirei. Red Crossbill. Thirty specimens: Lake Fork Mt., 10,000 feet, 32 mi. N. Duchesne, June 17-20, 1950; Timothy Creek, 7500 feet, 10 mi. N. Altonah, Duchesne County, June 23-25, 1950; 3 mi. S. Vernal, June 18, 1949. These, discussed by Selander (1953:158), were not breeding birds.

Loxia curvirostra grinnelli. Red Crossbill. Two specimens: Hideout Canyon. 9000 feet, Daggett County, September 13, 1950. These breeding birds, also considered by Selander (*op. cit.*:159), were taken in yellow pine and according to him were typical of this race in both size and coloration.

Chlorura chlorura. Green-tailed Towhee. One specimen: Naturalist Basin 11,300 feet, August 23, 1954. There were nine sight records for Naturalist Basin from August 6 to 17. These towhees were seen at all elevations in Naturalist Basin, but only in areas of some coniferous cover. Four records are from areas of spruce-fir forest, three from coniferous scrub, two from talus slopes bearing coniferous growth. The one specimen was taken on alpine tundra. Hayward (1952:116) reported the species as occurring in krummholz but did not list it for the upper montane in his earlier study (1945) of the biota of subalpine elevations. Twomey (*op. cit.*:466) found it breeding in submontane shrubs from 7000 to 8000 feet and took

a juvenile just able to fly on June 26. At this time adults were conspicuous and feeding young. These dates suggest that the birds found in Naturalist Basin were postbreeding wanderers. However, the species occurred singly, or occasionally in family groups, rather than large flocks.

Pipilo erythrophthalmus montanus. Rufous-sided Towhee. Two specimens: Hideout Canyon, 5500 feet, Daggett County, September 12, 1950; Winn Ranch, Mouth Argyle Canyon, 5600 feet, Duchesne County, April 23, 1938.

Calamospiza melanocorys. Lark Bunting. One specimen: Jensen, June 10, 1952. Killpack (1951:99) has taken several specimens. The records for Utah have been summarized by Porter and Egoscue (1954:220-221).

Pooecetes gramineus confinis. Vesper Sparrow. Five specimens: 7 mi. W. Myton, June 20, 1949; 10 mi .S. Myton, April 23, 1938; Paradise Park, July 28, 1953; East Park, 9000 feet, 20 mi. N. Vernal, August 21, 1949. Those from the Myton area occured in desert scrub, those from the mountains were taken from lodgepoles pines at the edge of parkland areas.

Junco hymenalis hymenalis. Slate-colored Junco. One specimen: Smith-Morehouse Cr., at Weber R., 7100 feet, Summit County, October 10, 1931. This was reported by Behle and Higgins (1942: 55).

Junco oreganus shufeldti. Oregon Junco. One specimen: Tabiona, October 18, 1931.

Junco caniceps caniceps. Gray-headed Junco. Thirty four specimens: 12 mi. E. Oakley, 7500 feet, May 26, 1950; Smith-Morehouse Canyon, 8000 feet, May 28, 1932 and May 27, 1950; 22 mi. E. Kamas, 8500 feet, May 30, 1953; Mirror Lake, September 22, 1932; Mouth Brown Duck Canyon, 8500 feet, nr. Moon Lake, September 2, 1948; Lake Fork Mt., 10,000 feet, 32 mi. N. Duchesne, June 21, 1950; Timothy Cr., 7500 feet, 10 mi. N. Altonah, July 24, 1950; Paradise Park, July 27, 1953; Oak Park, 9300 feet, 25 mi. N. Vernal, July 23, 1949; Spirit Lake, July 6-10, 1956. This Junco is, below timberline, the most obvious bird, as is the pipit in alpine areas. But it ranges more widely than the pipit, for we found it at all altitudes where there occurs the combination of coniferous growth and a fairly rich herbaceous flora. The species was not discovered, however, in the semiarid areas of alpine tundra and coniferous scrub that occur above 11,000 feet. Although Hayward (1952: 116) reports it in krummholz, he earlier noted (1945:69) that it is most often seen at the forest edge. We have 117 sight records for the high western Uintas. The specimens were taken in aspens, spruces, lodgepole pine, yellow pine, and willows.

The single nest we found was under a rotten log near a stand of conifers. The birds were, in our experience, ordinarily restricted to the forested areas until the young were well grown, although the adults forage in meadows and along streams and lake shores. Flocks larger than family groups were not found before the first of August. As the young become more hardy, family groups ap-

parently coalesce into sizeable flocks of as many as thirty birds, and averaging perhaps half that number, which wander through the forests and into the meadows. Somewhat less frequently, they appear above timberline. Juncos occurred in mixed flocks with chipping sparrows, mountain chickadees, white-crowned sparrows and Audubon warblers.

Spizella passerina arizonae. Chipping Sparrow. Six specimens: Smith-Morehouse Canyon, May 20, 1934; 3 mi. S. Vernal, August 27, 1949; Spirit Lake, July 9, 1956. For the high western Uintas there were 24 sight records. Although they never appeared in large numbers, they were found consistently in most habitats below timberline until the middle of August. The chipping sparrow is reported by Hayward (1952:116) to appear in the krummholz, and Twomey (*op. cit.*:473) states that the species nests from yellow pine to timberline.

Zonotrichia leucophrys oriantha. White-crowned Sparrow. Nineteen specimens: Mirror Lake, July 13, 1935; 22 mi. E. Kamas, June 9, 1953; Lake Fork Mt., 10,000 feet, 32 mi. N. Duchesne June 21, 1950; Paradise Park, July 21, 1947 and July 27, 1953; 1 mi. below Merkley Park, 6000 feet, 9 mi. N. Vernal, September 5, 1949; Spirit Lake, July 6-9, 1956. We have 51 sight records for the Naturalist Basin region where it is a common summer resident. The species had a wider altitudinal range, than most montane birds. It was numerous to 11,400 feet. Its habitat requirements seemed to be coniferous growth and adjacent open areas; the species was found wherever these needs were met. Hayward (1952:116) termed it the most frequent krummholz species and listed it (1945: 114) in both seral and climax stages of the Upper Montane. Family groups were fairly frequent, but no large flocks were found in the Uintas. It was observed in mixed flocks with gray-headed juncos and Audubon warblers.

Zonotrichia leucophrys gambellii. White-crowned Sparrow. Two specimens: Smith-Morehouse Cr. at Weber River, 7100 feet, Summit County, October 11, 1931; 1 mi. below Merkley Park, 6000 feet, 9 mi. N. Vernal, September 5, 1949. Both of these were immature and migrants.

Passerella iliaca swarthi. Fox Sparrow. Three specimens: Chalk Cr., 5600 feet, 5 mi .E. Coalville, June 15, 1949; Oakley, 6517 feet, May 29, 1950. They were taken in willows and rose thickets.

Melospiza lincolnii alticola. Lincoln's Sparrow. Sixteen specimens: Smith-Morehouse Cr. and Weber River, 7100 feet, October 10, 1931; near Merkley Park, 10 mi. N. Vernal, September 4, 1949.

Melospiza lincolnii altocila. Lincoln's Sparrow. Sixteen specimens: 12 mi. E. Oakley, 7500 feet, July 20, 1950; Naturalist Basin, 10,400 feet, August 22, 1954; Lake Fork Mt., 10,000 feet, 32 mi. N. Duchesne, June 21, 1950; Paradise Park, July 28, 1953, Spirit Lake, July 5-8, 1956. We have only two records in Naturalist Basin, both near Morat Lake, 10,400 feet, on August 22, 1954 and August

13, 1955. The first occurred in talus, the second in scrub fir. They were probably postbreeding wanderers. At Spirit Lake the breeding habitat was willows at the edges of streams or lakes, or bogs in the spruce forest. Twomey (*op. cit.*:475) found the species breeding in a bog in spruce-fir forest at 10,500 feet near Bald Mountain and Hayward (1945:114) reports it only in seral stages, noting that it was confined to willow thickets along streams and shrubs in snowslide areas.

Melospiza melodia montana. Song Sparrow. Fifty-one specimens: Chalk Cr., 5600 feet, 5 mi. E. Coalville, June 15, 1949; 10 mi. E. Oakley, 7200 feet, May 29, 1950; 3 mi. S. Moon Lake, 7000-8400 feet, September 3, 1948; Lake Fork Cr., nr. Mt. Emmons, 6000 feet, August 4, 1934; Arcadia, 5000 feet, 4 mi. NE. Duchesne, September 3, 1949; Winn Ranch, 5600 feet, near Argyle Canyon and Minnie Maud Cr., 25 mi. S. Duchesne, April 23, 1938; 7 mi. W. Myton, June 20, 1949; Merkley Park, 6000 feet, 10 mi. N. Vernal, June 21-22 and September 4, 1949; Dry Fork Canyon, 6000 feet, 15 mi. N. Vernal, June 29, 1950; mouth Birch Cr., July 11, 1956. Specimens were taken from willows primarily but also in rose, birch, and hawthorn.

Calcarius lapponicus alascensis. Lapland Longspur. This was reported for the first time from Utah by Killpack (1953:152), who took a male at Roosevelt on January 1, 1952.

Plectrophenax nivalis nivalis. Snow Bunting. Killpack (1953: 152) has reported this species from the Uinta Basin. A male was banded at Roosevelt on January 2, 1952. A flock of 15 was observed 4 miles north of Fort Duchesne from January 14 to February 10, 1952 and a male collected on January 14, 1952.

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NEW AND UNUSUAL RECORDS OF BIRDS FROM THE UINTA BASIN, UTAH[1]

Merlin L. Killpack and C. Lynn Hayward

Since the publication of Twomey's (1942) account of the birds of the Uinta Basin, Utah, several new and unusual records of birds have been brought to light through our field work in that area. These records along with annotations are hereby published as a contribution of Utah ornithology.

Synthliboramphus antiquus. Ancient Murrelet.

One female was taken at Roosevelt, Duchesne County, November 12, 1955 by V. O. Walker. The bird appeared to be in good physical condition. At the time of the collection there were several days of heavy winds from the west. Specimens were reported by Gullion (1956) in northwestern Nevada at this same time.

Glaucidium gnoma pinicola. Rocky Mt. Pygmy Owl.

A female specimen was collected in a yellow pine-aspen woodland along the Uinta River about twelve miles north of Neola, Duchesne County, June 22, 1957. There was evidence from her actions that she had a nest in the vicinity. Twomey (1942: 399) listed this owl as hypothetical but did not have a positive record for the Uinta Basin.

Melanerpes erythrocephalus caurina. Red-headed Woodpecker.

Two males were collected in cottonwoods about eight miles south of Ouray, Uintah County, May 29, 1955. Twomey (1942: 19) found one dead in about this same locality. We also have an unpublished sight record of this species from near Jensen, July 27, 1937.

Thryomanes bewickii eremophilus. Desert Bewick Wren.

Twomey (1942) does not report the Bewick Wren from the Uinta Basin. We found it to be a fairly common species in the scattered pinyon-juniper woodlands east of the Green River. Two specimens were taken at Bonanza and Rainbow, Uintah County, June 18 and 22, 1954. There were numerous sight records for the same area.

Toxostoma rufum longicauda. Western Brown Thrasher.

A male was collected eleven miles northwest of Roosevelt, Duchesne County, December 29, 1954. It was feeding on the fruits of the Russian olive and was fat and in good physical condition.

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1. Department of Zoology and Entomology, Brigham Young University, Provo, Utah, Contribution No. 159.

Mimus polyglottos leucopterus. Western Mocking bird.

Twomey (1942: 427) regards this species as rare in the Uinta Basin. Our observations indicate that it is a regular though uncommon resident of that area. A male and female were collected five miles west of Roosevelt, May 24 and 25, 1955. There was some evidence that they were preparing to nest. Sight observations were also made at eleven miles east of Jensen, Uintah County, June 9, 1953, two miles north of Roosevelt, May 20 to August 15, 1955, and May 6, 1956, and Rainbow, Uintah County, June 16, 1954.

Dendroica townsendi. Townsend's Warbler.

One female was taken from a flock of 50 to 60 birds 17 miles north of Neola, Duchesne County, August 24, 1957. The birds were apparnetly migrating in company with Pileolated Warblers. All were observed in a grove of lodgepole pines.

Sturnus vulgaris vulgaris. Starling.

Killpack and Chittenden (1952) previously reported on the winter status of starlings in the Uinta Basin. The birds are now known to be permanent residents. Several nests have been found in old wookpecker holes. A set of six eggs was collected May 15, 1954 three miles west of Roosevelt, Duchesne County. Many birds have been captured and banded. Returns on the banding have been received from North and South Dakota and Montana.

Guiraca caerulea interfusa. Western Blue Grosbeak.

A male was collected five miles east of Myton, Duchesne County, June 8, 1957. Another male was seen at the same time. The birds were singing and there were other indications of nesting in the area. From other records available to us it seems likely that this species breeds regularly although not commonly along the Colorado and Green River drainages at least as far north as the Uinta Basin. Behle and Selander (1952:31) have also recorded specimens from Vernal, Uintah County.

Acanthis flammea flammea. Common Redpoll.

One female redpoll was collected from a flock of about forty found in a pinyon-juniper woodland about eleven miles west of Roosevelt, Duchesne County, January 1, 1958. The birds were feeding on the seeds of Russian thistle. A male was seen at Roosevelt, December 28, 1956 with a flock of pine siskins feeding on sunflower seeds.

Spizella arborea ochrocea. Western Tree Sparrow.

One specimen was collected at Arcadia, Duschesne County, January 21, 1957.

Zonotrichia querula. Harris's Sparrow.

Indications are that this species is a regular winter resident in the Uinta Basin. Two males were collected three miles east of

Myton, Duchesne County, December 3 and 29, 1955 from a flock of ten to fifteen birds that were in the company of a large flock of White-crowned Sparrows. Two birds were captured and banded at Roosevelt, Duchesne County in January 1957. One of these was recaptured in the same locality in April of the same year. On December 28, 1957 a flock of about thirty Harris's sparrows was observed along the Duchesne River five miles west of Myton.

Calcarius lapponicus alascensis. Alaska Longspur.

This species was previously reported for the Uinta Basin by Killpack (1953). Additional observations indicate that longspurs are regular winter residents in the basin. Three males and one female were taken in the vicinity of Myton, Duchesne County, December 17, 1955, January 28, 1956, and February 8, 1958. The specimens were taken from small flocks that were associated with large aggregations of horned larks. Another male was collected eight miles south of Roosevelt, January 15, 1957. Four additional birds were captured and banded at Roosevelt between January 23 and January 31, 1957.

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DISTRIBUTION AND VARIATION OF THE UTAH POULATION OF THE GREAT BASIN POCKET MOUSE[1]

C. Lynn Hayward and Merlin L. Killpack

The previously known range of the Great Basin Pocket Mouse (*Perognathus parvus*) in Utah was published by Durrant in 1952, pp. 241-244, and figure 41. At the time of Durrant's first publication this species was thought to be confined in the state of Utah almost exclusively to the Great Basin. The only exceptions were the small population found near Greenriver, Utah, west of the Green River, by Durrant; two specimens taken by Vernon Bailey many years ago at Laketown, Rich County, which locality, however, actually falls within the Great Basin drainage; and two collected by Svihla (1931 .p. 262) near Linwood in Daggett County. Both the Green River and Linwood specimens were taken within the Colorado River drainage. Additional collecting within the past few years has added further information on the occurrence and probable relationships of this interesting species which would seem to warrant some comment at this time.

Recent collections would indicate a somewhat discontinuous range in areas outside of the Great Basin, but the writers are inclined to believe that this seeming discontinuity will dissappear as additional field work is done. Since *Perognathus parvus* may live at relatively high elevations as compared to other species of pocket mice in this area, there would seem to be no continuous mountain barriers that could seriously interfere with its spread out of the Great Basin and into those portions of the Colorado Basin where it is now known to live. Up to this point, however, the species is not known to occur east of the Green and Colorado Rivers, and it may be that these streams could afford an effective barrier to the spread of these pocket mice eastward.

The slow accumulation of data relative to the distribution of *Perognathus parvus* may be due in part at least to what seems to be a definite tendency toward fluctuation in population numbers from time to time. This has been borne out by our experience in sampling mammal population in Cedar Valley which lies directly west of Utah Lake. On our first visit to that valley in 1936 we took no pocket mice of any kind. In subsequent visits up until the beginning of World War II the results were the same. When we resumed our trapping after the war years we still found no pocket mice until 1949 when, using the same kind of traps and bait in the same places at comparable seasons, we began to take more pocket mice than any other species. These high populations seem to have prevailed at least up until the close of 1952 and possibly even longer, although we have done no field work in the Cedar Valley

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area since 1953. Thus, it would appear likely that trapping in off years might not reveal the true state of distribution of this species.

From the records now available and the nature of the habitat between the collection localities it seems evident that *Perognathus parvus* is to be found in all of the counties of the state that lie west of the Green and Colorado Rivers. Our collections in Beaver and Iron Counties verify the supposition that the species extends at least to the southernmost rim of the Great Basin. Its presence in the Colorado River drainage east of the central Utah mountains and high plateaus is well indicated by our collections from Duchesne, Carbon, Emery, and Garfield Counties in addition to its discovery at Greenriver, Utah as well as other localities in the Colorado River drainage by Durrant. The probable connection of the Great Basin population with those of Rich, Summit, and Daggett Counties may be supposed by collectiois from Morgan, Summit, and much additional material from Rich County. A list of the precise collection localities now available in addition to those published by Durrant (*op. cit.*, 1952) is as follows:

Utah County: Head of Slate Canyon, east of Provo, Cedar Valley. *Tooele County*: Lookout Pass, Rush Valley, Government Creek, Mercur. *Beaver County*: Wah Wah Springs, Minersville. *Juab County*: Joy, Callao. *Boxelder County*: Lucin. *Summit County*: Echo Junction. *Iron County*: Parowan. *Garfield County*: Panguitch, Spry, 20 miles on n.w. Hite. *Sevier County*: Fish Lake, Koosharum, Paradise Valley. *Duchesne County*: Roosevelt and Myton. *Daggett County*: Linwood. *Rich County*: Woodruff. *Emery County*: Huntington. *Carbon County*: Price. *Kane County*: Pine Dunes and Navajo Wells.

In the course of our field work we have made hundreds of notations regarding the habitat preferences of *Perognathus parvus*. According to our experience the animal almost invariably inhabits benchlands and the lower slopes of mountains at elevations ranging from 4,500 to 6,500 feet. However, years ago, a specimen was taken by James Bee in the Wasatch Range east of Provo at an elevation of nearly 8,000 feet indicating that the species may inhabit higher elevations than we now realize. In his studies of the mammals of Cedar Valley, Utah County, Woodbury (MS, 1955) found *Perognathus parvus* very common in sandy flats in the valley where rabbit brush (*Chrysothamnus*) and Indian rice grass (*Oryzopsis hymenoides*) were the predominant plants. In his study of the Great Basin Desert of western Utah, Fautin (1946, p. 280) found this species only in the sagebrush community. By far the great majority of our specimens have been taken in sagebrush on the higher benchlands around the bases of hills and mountains. They occur commonly on rocky soils and often extend well up onto the steeper slopes where the ground is strewn with loose boulders or talus material. Frequently they are taken in situations where one would expect to find *Perognathus formosus;* i.e. on rocky slopes. At Joy, Juab County, we found *Prognathus parvus* and *Perognathus formosus* living together on rocky slopes, but *P. parvus* also lived on flats where shadscale (*Atriplex*) and rabbit brush (*Chrysothamnus*) were predominant on fine gravelly soil. In the vicinity of the Henry Mountains, Garfield County, *P. parvus* was taken around

the bases of sandstone ledges as well as in open sandy flats vegetated with blackbrush (*Coleogyne ramosissima*) and jointfir (*Ephedra*).

Our observations have led us to conclude that *Perognathus parvus* occupies a wider range of altitude and a greater variety of habitat than any other species of pocket mouse found in this area.

Variations

Durrant in his first account (1952) recognized only two subspecies in the Utah population; namely, *Perognathus parvus olivaceous* Merriam of the Great Basin described from Kelton, Boxelder County, Utah in 1889, and *P.p. clarus* Goldman, a race supposed to occur in northeastern Utah and named from the former townsite of Cumberland, Lincoln County, Wyoming.

Later Durrant, Lee, and Hansen, (1955) recorded *Perognathus parvus trumbullensis* in samples of populations from Washington and Garfield Counties. Still later (Durrant and Lee, 1956) a new subspecies (*Perognathus parvus bullatus*) was described from the area west of the Green and Colorado Rivers and between the San Rafael and Fremont Rivers. Durrant considers *P. olivaceus amoenus* Merriam from Nephi, Utah, and *P.p. plerus* Goldman from Stansbury Island, Great Salt Lake, as synonyms of *P.p. olivaceus*. However, Miller and Kellogg (1955) retain the name of *P.p. plerus* as valid.

From the material available to the writers is seems likely that at least two or three additional subspecies of *P. parvus* will eventually be recognized from the Utah population when opportunity is afforded to make proper comparisons and analyses. It is our purpose to comment upon these variations as noted to the present time as follows:

Uinta Basin, Duchesne County. In all three body measurements this series averages smaller than either *olivaceous* or *clarus*. The skulls average distinctly longer (27.1 vs. 24.8) than in *clarus* and slightly longer than in *olivaceous*. The interparietals in the Uinta Basin series are longer and narrower than in either *olivaceous* or *clarus*. In coloration the Uinta Basin series is closer to *olivaceous* than to *clarus* since they have the darker buffy ground color and the wider lateral stripe characteristic of the former.

Linwood, Daggett County. Compared with a good series of topotypes of *P.p. clarus* from Cumberland, Wyoming, the Linwood series shows some signs of intergradation between *olivaceous* and *clarus*. However, in both cranial measurements and color they lie decidedly closer to *clarus* as might be expected from their continuous ranges. In coloration the Linwood series is very close to *clarus* in that it possesses the paler buffy ground color and narrow lateral stripe. However, the *clarus* topotypes have decidedly more dark hairs on the dorsum and in that respect are closer to the Laketown series.

Laketown, Rich County. From the more or less continuous nature of the sagebrush plains of the area it might be expected that the Laketown population would be closest to *P.p. clarus.* The relatively low divide separating the Green and Bear River drainages would not seem to afford a serious barrior to the species. However, the Laketown series is larger on the average in most measurements taken than the *clarus* topotypes. A greater skull length is owing in the main to longer nasals in the Laketown specimens (10.6 vs 9.7). Body measurements in Laketown material averaged greater, although not significantly so, than *clarus.* In coloration, there is a striking difference between the Laketown and Cumberland series. In the former the ground color is much darker, between cinnamon buff and pinkish cinnamon rather than pinkish buff. Lateral stripes on the Laketown specimens are wider and more distinct than in *clarus* topotypes. Dark hairs of the back are strikingly more prominent in the Laketown series with a tendency to form black patches on the rump and a distinct black mid-dorsal line. In matters of cranial measurements, body measurements, and ground color they seem closer to *olivaceous* than to *clarus.* They differ from *olivaceous* in the striking black hairs of the dorsum.

Head of North Wash, Garfield County. A striking series of specimens from the head of North Wash near the east base of the Henry Mountains seems to be representative of a distinctive population of *Perognathus parvus* inhabiting the deseret plains surrounding that isolated mountain range. Comparing our series with the Great Basin *P.p. olivaceous,* we find the North Wash series has a wider carium owing to more inflated bullae, but the interorbital breadth is slightly less. In coloration the North Wash specimens are distinctly different from all other kinds represented in our collection. The ground color is bright cinnamon buff rather than pinkish buff but the buffy stripes on the sides are indistinct. A reduction of the dark hairs on the back gives the animal a brighter and more buffy appearance in general and such dark hairs as there are are confined to a rather distinct mid-dorsal stripe which is especially evident between the ears. The subauricular white patches are larger and the tail is more buffy throughout in the North Wash series.

Great Basin. Series of *Perognathus parvus* from different parts of the Great Basin in Utah show some variations in body size, cranial measurements and coloration, but our series from the southern part of the basin are not large enough to permit a comparison.

Summary

The previously known distribution of *Perognathus parvus* in Utah principally in the northern Great Basin and the northeastern part of the state has now been extended to the southern rim of the Basin and eastward to the Green and Colorado Rivers. It now has been verified that the species occurs in all of the coun-

ties east of those rivers. Future collecting probably will reveal that the species has a more or less continuous range.

Populations in Daggett County undoubtedly belong to the Wyoming race, *P.p. clarus*, but those from Rich County probably represent an undescribed race. The populations in the Uinta Basin and in Garfield County around the base of the Henry Mountains may also represent new races.

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AN OUTBREAK OF SAY'S PLANT BUG IN UTAH VALLEY, 1958

Recently several species of insects in this area have been observed to get beyond the bounds of natural control and appear in unusual numbers. Around the middle of May Say's Plant Bug, *Chlorochroa sayi* Stal., began to appear in great numbers throughout the Provo area. It is ovopositing on the mustard, *Descuriana pinnata* (Walt.) Britt. Subsp. *glabra?* (W. S.) Dilling and other associated plants. A predaceous beetle *Collops bipunctatus* Say has been reported as feeding on the eggs and nymphs of this species. Two of my advanced Entomology students, Wilber G. Robison and Stanley Kay Taylor, collected more than 2,000 specimens of this pentatomid in an hour from mustards and other weeds and grasses growing on a vacant lot in west Provo. Mr. Taylor is making a study of the life history and parasites of this species.

Chlorochroa sayi is widely distributed in the Western United Stataes having been collected in the states from Mexico to Canada. It is shield-shaped, differing between a bright green and a dark green color with three small white spots on the anterior and one on the posterior of the scutellum. It varies from 12 to 14 mms. in length. It passes the winter as an adult, eggs being laid in the spring. It takes approximately six weeks for adults to develop. In this area there are 2 to 3 generations each year. The Say's Plant Bug does damage to alfalfa, wheat, oats, peas, beans, grasses, cotton and weeds. Alfalfa grown for seed and wheat are frequently damaged in Utah and Arizona. Effective control of this species is obtained with D.D.T., chlordane, aldrin, or dieldrin. Information concerning the applications of sprays may be obtained from the County Agent's office.

——Vasco M. Tanner

UNDESCRIBED SPECIES OF WESTERN NEARCTIC TIPULIDAE (DIPTERA). III.[1]

Charles P. Alexander[2]

The preceding parts under this general title were published in The Great Basin Naturalist, 4:89-100; 1943 and 5:93-103; 1944. At this time I am discussing various species and subspecies belonging to the tribe Pediciini, chiefly collected by myself but with two interesting forms taken by my friend, Mr. James H. Baker, of Baker, Oregon. The types are preserved in my extensive collection of the World Tipulidae.

Pedicia (*Tricyphona*) *pahasapa*, n. sp.

Belongs to the *katahdin* group; general coloration of thorax gray, praescutum with four brown stripes; antennae brownish black throughout, apparently 13- segmented, terminal segment elongate; wings weakly tinged with yellow, very restrictedly patterned with darker; male hypopygium with the dististyle unarmed.

Male: Length about 7-7.5 mm.; wing 6:8-8 mm.; antennae about 0.8-0.9 mm.

Rostrum dark brown, sparsely pruinose; palpi brownish black. Antennae brownish black throughout, apparently 13-segmented; basal flagellar segments subglobular, crowded, outer segments oval, terminal segment elongate, about one-half longer than the penultimate. Head brownish gray; anterior vertex broad.

Pronotum brownish gray. Mesonotal praescutum gray, with four brown stripes, the longer intermediate pair narrowed behind, virtually confluent at the suture; scutum gray, lobes patterened with brown; scutellum dark gray, mediotergite lighter gray. Pleura light gray; dorsopleural membrane buffy brown. Halteres with stem obscure yellow, restrictedly darkened at base, knob dark brown. Legs with the elongate coxae buffy, sparsely pruinose; trochanters testaceous yellow; femora light brown, tips passing into brownish black; tibiae dark brown; tarsi black. Wings weakly tinged with yellow, very restrictedly patterned with darker, including narrow seams at Sc_2, origin of *Rs*, cord, tip of *Sc*, and very vaguely at R_2 and elsewhere; veins brown, *Sc*, *R* and *Cu* more yellowed. Venation: *r-m* variable in position, from near one-third to midlength of R_{4+5}; cell M_1 variable in length, in cases very reduced and probably lacking in certain specimens in a large series; *m-cu* before the fork of *M*.

Abdomen dark brown, sparsely pruinose; hypopygium dark brown. Male hypopygium with the interbase as in the *katahdin* group, conspicuously setiferous on outer half. Apical lobe of basistyle low and obtuse, not extended caudad beyond the dististyle,

1. Contribution No. 1288 from the Entomological Laboratory of the University of Massachusetts.

2. University of Massachusetts, Amherst, Massachusetts. I am greatly indebted to the National Science Foundation for financial aid in conducting the field explorations in California in 1957.

with abundant spicules. Dististyle subrectangular, without tubercles or spines, the inner margin with about eight or nine long strong bristles.

Habitat: South Dakota (Black Hills).

Holotype, ♂, Midway Creek, Harney Peak, altitude 6,500 feet, June 16, 1953 (Alexander). *Paratopotype*, ♂.

The specific name, *pahasapa*, is derived from the Sioux, *paha* meaning hills, *sapa* black. This is the most westerly known member of the *katahdin* group and the first from west of the 100th meridian. The fly is readily told from the eastern Nearctic members of the group, including besides *Pedicia* (*Tricyphona*) *katahdin* Alexander, also *P.* (*T.*) *macateei* Alexander, *P.* (*T.*) *paludicola* Alexander, and the doubtfully distinct *P.* (*T.*) *pumila* Alexander, by the unarmed dististyle of the male hypopygium. All of the other species are provided with a strong tubercle that is tipped with from one to five spines or spinelike setae.

Pedicia (*Tricyphona*) *ampla cinereicolor*, n. subsp.

Generally as in typical *ampla* Doane, differing in the small size, narrow wings, general gray coloration, and in details of color and structure.

Male: Length about 15 mm.; wing 14x2.7 mm.; antenna about 1.8 mm.

Rostrum brownish gray; palpi brownish black. Antennae with basal four segments yellowish brown, the remainder passing into black; outer flagellar segments becoming progressively smaller, with short verticils. Head gray; anterior vertex with a small darkened spot at summit of tubercle.

Mesonotum gray, the praescutum with four brown stripes, the intermediate pair widely separated, narrowed to acutely pointed behind; scutal lobes dark; more buffy areas behind the midpoint of the suture, posterior ends of the scutal lobes and the parascutella. Pleura with propleura, mesepisternum and metapleura gray, the mesepimeron and meron paler. Halteres with stem whitened, knob infuscated. Legs with coxae more or less darkened, especially the posterior pair; remainder of legs brownish yellow, outer tarsal segments darkened. Wings narrow, as shown by the measurments, about five times as long as broad. Venation: Cell *1st* M_2 closed; cell M_1 nearly twice its petiole; *m-cu* at fork of *M*.

Abdomen dark brownish gray, the sides of the tergites narrowly buffy, posterior margins of the sternites more narrowly so. Male hypopygium with the tergal lobe moderately broad, its posterior border gently concave, the margin vaguely crenulate. Apical setae of basistyle relatively small. Outer dististyle small, oval, the lower inner angle prolonged, setae well distributed over the surface, longer than the style. Inner dististyle 5-pronged, as in the *ampla* group, all arms obtuse at tip, the group broader than long.

Habitat: California (Inyo County).

Holotype, ♂, Intake Camp, Bishop Creek, altitude 8,000 feet, July 8, 1957 (Alexander).

Pedicia (*Tricyphona*) *ampla perangusta*, n. subsp.

Generally as in typical *ampla* Doane, differing in the small size, narrow wings, and details of structure of the male hypopygium.

Male: Length about 15 mm.; wing 13.5x2.9 mm.; antenna about 1.7 mm.

Antennae chiefly pale, the outer seven or eight segments blackened. Mesonotal praescutum chiefly ochreous, intermediate praescutal stripes broad, wider than the separating interspace, lateral stripes pale. Pleura chiefly ochreous, sternopleurite darker. Halteres with knob strongly darkened. Legs with all coxae pale yellow; remainder of legs brownish yellow, femoral tips narrowly but evidently dark brown; outer tarsal segments brownish black. Wings narrow, as shown by the measurements, slightly more than four and one-half times as long as broad. Venation: Cell *1st* M_2 narrow, open by atrophy of *m* in one wing; cell M_1 deep, nearly three times its petiole; *m-cu* about one-third its length beyond the fork of *M*.

Abdomen buffy, both the tergites and sternites with a darkened central stripe, lateral tergal borders slightly more pruinose, internally with a very narrow dusky line that becomes more evident on the outer segments; a narrow subterminal black ring that includes segment eight and most of nine, remainder of hypopygium yellow. Male hypopygium with the tergal lobe moderately broad, the posterior border truncate, straight. Apical setae of basistyle of moderate length, much shorter than in some other members of the *ampla* group. Outer dististyle small, broadly oval, with numerous setae, some being short and spinoid. Inner dististyle 5-pronged, as in the group; two of the inner arms broadly joined at base, the lower point triangular.

Habitat: Oregon (Baker County).

Holotype, ♂. Spring Creek, Whitman National Forest, near Baker, in foothills of Blue Mountains, altitude 3,900 feet, May 30, 1956 (Baker).

Pedicia (*Tricyphona*) *aspidoptera convexa*, n. subsp.

Male: Length about 12 mm.; wing 1.2 mm.

Differs from typical *aspidoptera* (Coquillett, 1905) in the structure of the male hypopygium. Ninth tergite with the caudal border very gently convex (as figured by the writer in American Midland Naturalist, 29:162, fig. 16; 1943). In typical *aspidoptera*, the caudal margin of the tergite is conspicuously emarginate, forming small but distinct lateral lobes.

Habitat: Colorado (Gunnison County).

Holotype, ♂, mounted on slide, Gothic, on slopes of Gothis Mountain, altitude 9,800 feet, July 3, 1934 (Alexander).

Pedicia (*Tricyphona*) *steensensis*, n. sp.

Belongs to the *ampla* group; size large (length of male about 15 mm.); mesonotal praescutum brown, with three darker stripes; wings reduced to narrow straplike blades in both sexes; male hypopygium with the apex of the tergal lobe truncate or virtually so.

Male: Length about 15 mm.; wing about 3 mm.; antenna about 1.5 mm.

Female: Length about 18 mm.; wing about 3 mm.

Rostrum and palpi brownish black. Antennae short; scape light brown, the remainder black; flagellar segments short-oval, passing into oval, verticils inconspicuous. Head dark brownish gray, with a capillary darker vitta extending from the small vertical tubercle posteriorly.

Pronotum brown, darker in the male. Mesonotal praescutum brown, with three darker stripes, the pattern darker in the male; posterior sclerites of notum dark brownish gray in male, the postnotum paler in the female; parascutella yellowed in both sexes. Pleura chiefly brownish gray in male, paler in female. Halteres with stem whitened, knob dark brown. Legs with coxae brown; trochanters yellow; in male remainder of legs darker than in female, femora dark brown, yellowed basally, tibiae brownish yellow, brownish black at tips, outer tarsal segments dark brown; in female legs more uniformly medium brown, the femoral tips not darkened. Wings greatly reduced to long narrow strips, virtually equal in both sexes; basal half yellowed, outer part more infuscated; tips narrowly obtuse, more so in female.

Abdomen of male dark brown, lateral borders of both tergites and sternites very narrowly obscure yellow; in the female, abdomen reddish brown, the lateral margins not paler; posterior borders of intermediate segments very narrowly obscure yellow; hypopygium brownish black, styli brownish yellow. Male hypopygium with the tergal lobe relatively broad, about as in *ampla*, gradually narrowed outwardly, the posterior border virtually truncate, not emarginate as in *ampla*. Disistyles much as in *ampla*, the small fleshy outer style more oval, its tip obtuse.

Pedicia (*Tricyphona*) *aspidoptera* (Coquillett), of the southern Rocky Mountain region, has the wings even more reduced in both sexes, differing further from the present fly in details of structure of the male hypopygium, particularly the tergite.

Habitat: Oregon (Harney County).

Holotype, ♂, Fish Lake, Steens Mountains, altitude 7,200 feet, July 14, 1953 (Baker). *Allotopotype*, ♀, pinned with the type.

The only described species of the subgenus that are subapterous in both sexes are *Pedicia* (*Tricyphona*) *aspidoptera* (Coquillett), discussed before, *P.* (*T.*) *degenerata* Alexander, and *P.* (*T.*) *subaptera* Alexander. The second species belongs to a different group of the subgenus, the last is not sufficiently known at this time to make any definite statement as to its position but is very definitely distinct from the present fly. The stenopterous condition of this insect is quite different from the brachypterous type found in *aspidoptera* and *subaptera*. It may be noted that large-sized subapterous members of the subgenus have been found elsewhere in the western United States, particularly in California, but have not been critically studied to this date. Due to the absolute flightlessness of all of these flies it would seem that they must have evolved

independently in the various mountain areas where they now occur.

Pedicia (*Tricyphona*) *shastensis*, n. sp.

Belongs to the *townesiana* group, allied to *unigera;* size small (wing of male about 8 mm.); mesonotal praescutum buffy brown with four darker brown stripes, the intermediate pair approximated; pleura variegated obscure yellow and brown; wings weakly tinged with brown, stigma slightly darker; male hypopygium with the lateral tergal lobes relatively conspicuous; dististyle occupying the entire outer end of the basistyle, the spicules small, the outer blade narrowed at extreme tip; interbase produced into a long slender spine.

Male: Length about 7-7.5 mm.; wing 7-8 mm.; antenna about 0.7-0.8 mm.

Rostrum light brown; palpi brownish black. Antennae black throughout; basal flagellar segments oval, passing into long-oval, much shorter than the longest verticils. Head brown.

Pronotum light brown. Mesonotal praescutum buffy brown, with four darker brown stripes, the intermediate pair very narrow, only vaguely separated by a slightly paler vitta; scutal lobes dark brown, the median area, with the scutellum, more testaceous, vaguely pruinose; mediotergite more evidently pruinose, pleurotergite paler. Propleura, mesepimeron and metapleura obscure yellow, the mesepisternum darker; dorsal sternopleurite pale; dorsopleural membrane obscure yellow. Halteres dusky, base of stem restrictedly yellow. Legs with the coxae and trochanters pale yellow; remainder of legs brownish yellow to pale brown; terminal tarsal segments darker. Wings weakly tinged with brown, stigmal region very slightly darker, prearcular field vaguely yellowed; veins brown. Venation: R_1+_5 subequal to *r-m*, the latter at or close to its fork; cel M_2 closed or open by the atrophy of *m*, varying in this manner in the two wings of the holotype.

Abdomen dark brown, the apices of the sternites broadly obscure yellow; eighth and ninth segments brownish black to form a ring; styli brownish yellow. Male hypopygium most as in *unigera*, differing decisively in certain structures. Tergite with the median area of the posterior border slightly produced, lateral lobes relatively long and conspicuous. Basistyle with the apical lobe of the dististyle occupying the entire outer end of the style, broadly rounded, provided with abundant relatively short spines, the more basal ones small; outer blade of dististyle obliquely truncated, the extreme tip narrowly obtuse; interbase broad at base, slightly narrower on proximal half, the outer half produced into a long slender spine. Gonapophysis much shorter than the aedeagus, the latter expanded at apex into a small head, narrowed at its outer end. The hypopygium of *unigera* was figured at the time of the original description (American Midland Naturalist, 42:299, fig. 26; 1949).

Habitat: California (Shasta County).

Holotype, ♂, Castle Crags State Park, altitude 2,000 feet July 8, 1953 (Alxander). Paratopotypes 2 ♂ ♂.

The types occurred along small streamlets that flow into the Sacramento River at the Park. They occurred with many other crane-flies of unusual interest, including some further new species. At this date, the associated beautiful orchid, *Cephalanthera Austinae* (Gray), known as the phantom orchid or silver slipper, was common and in full flower. The regional members of the group include besides the typical form, *Pedicia* (*Tricyphona*) *townesiana* Alexander, also *P.* (*T.*) *fenderiana* Alexander, and *P.* (*T.*) *unigera* Alexander. The last named is the closest ally, differing evidently in the structure of the male hypopygium, including the tergite, interbase, and the dististyle.

Dicranota (*Rhaphidolabis*) *nooksackensis brevispinosa*, n. subsp.

Characters essentially as in typical *nooksackensis* Alexander, diffring in important details of the male hypopygium.

Apices of the tergal lobes broadly rounded; lateral tergal arm very broad, its apex obliquely truncated and produced into a short lateral spine. Blackened apical spine of the basistyle short, at end of a long paler cylindrical arm that is four to five times as long as the spine itself; interbase a small simple slender blade, its tip narrowly obtuse.

In *nooksackensis*, the apices of the tergal lobes are more pointed; lateral tergal arm small and slender, narrowed outwardly. Apical spine of the basistyle long and conspicuous, longer than the basal arm.

The nature of the differences between these two subspecies is so great that it is probable that two distinct species may be involved.

Habitat: Washington (Cowlitz County).

Holotype, ♂, Toutle River, near foot of Mount Saint Helens. July 8, 1956 (Alexander).

Dicranota (*Plectromyia*) *nooksackiae latistyla*, n. subsp.

Similar to typical *nooksackiae*, differing especially in the details of structure of the male hypopygium.

Outer dististyle longer, with spicules on the apical fourth. Inner dististyle conspicuously broader, angularly bent, at apex with a few strong setae; surface of style with relatively numerous setae. Interbase stouter.

Typical *nooksackiae* Alexander has the outer dististyle more slender, with spicules on apical third. Inner dististyle more slender, only moderately arcuated, the surface with fewer setae.

In *nooksackiae subtruncifer* Alexander, the median lobe of the ninth tergite is truncated across apex.

Habitat: Alberta (Jasper National Park).

Holotype, ♂. Punchbowl Creek, Miette Hot Springs, east of Jasper, altitude 3,400 feet. August 21, 1947 (Alexander). *Paratopotype*, 1 ♂.

SOME VIRTUALLY UNKNOWN NORTH AMERICAN PLATYPODIDAE (COLEOPTERA)

Stephen L. Wood[1]

Only a half dozen species of Platypodidae are currently recognized as occurring in America north of Mexico. It is, therefore, of interest that two species not known generally from this area have been added to our faunistic list and an additional species is described as new.

Platypus disciporus Chapuis

Figs. 1, 4, 6

Platypus disciporus Chapuis, 1865, Monographie des Platypides, p. 219, fig. 123; Schedl, 1937, Ent. Bl. 33:40.

Platypus flavicornis var. *disciporus*, Leconte, 1876, Proc. Amer. Philos. Soc. 15:343; Blatchley and Leng, 1916, Rhynochophora of North Eastern America, p. 582; Chamberlin, 1939, Bark and Timber Beetles of North America, p. 110.

To this species Chapuis referred his female type, from Tennessee, and the female specimen he identified that was later reported by Schedl, from West Virginia. Other writers have either ignored this species or included it as a variety of *flavicornis* (Fab.). A third female was taken at Dade City, Florida, on June 18, 1951, from the bole of a large windfallen *Quercus laurifolia*, by the writer. This species is not at all closely related to the other species of *Platypus* occurring in the United States. The female may be readily distinguished from them by the pair of unusually large pores on the disc of its pronotum (Fig. 6) and by the shape of its elytral apeces (Figs. 1, 4).

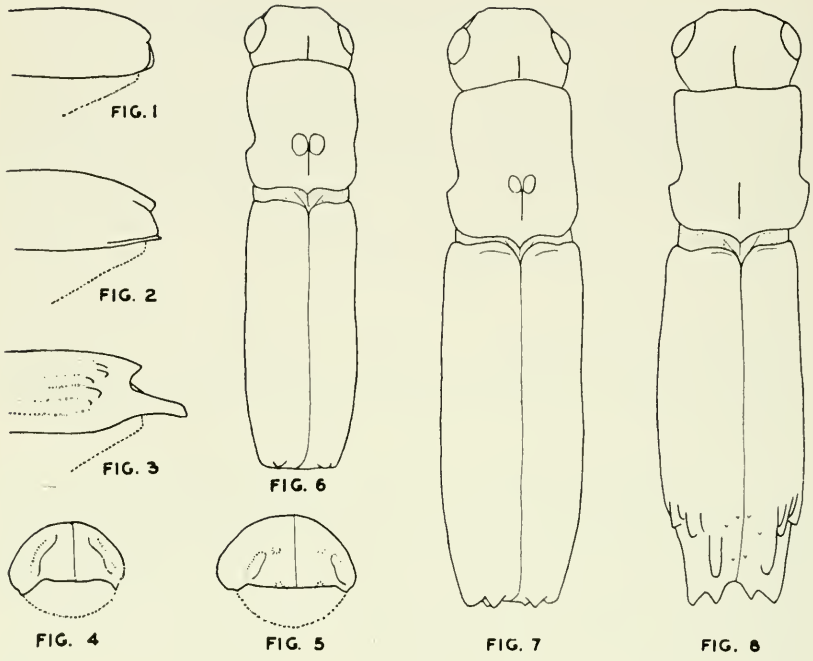
Platypus pini Hopkins

Figs. 2, 3, 5, 7, 8

Platypus pini Hopkins, 1906, Proc. Ent. Soc. Washington 7:71.

The writer was comparing specimens taken at 14 miles west of Texmelucan, Puebla, Mexico, on July 14, 1953, at an elevation of 8600 feet, from the base of a large pine tree, with Hopkins' type of *pini*, when he noticed a box of specimens of a *Platypus* species from Arizona and New Mexico, labelled as an undescribed species by Hopkins. When compared with the type it was clearly evident that both the Mexican and the specimens from the southwestern United States represented the species *pini*. Since this species, except for the type, from Mexico, has not been reported previously, the following records are included here. *Arizona*: Chiricahua Mountains, Sept. 14, 1907, *Pinus ponderosa* (Hopk. U. S. 5720c), Aug. 5, 1907, *Pinus chihuahuana* (Hopk. U. S. 5557), Oct. 16, 1907

1. Contribution No. 160, Department of Zoology and Entomology, Brigham Young University, Provo, Utah. Scolytoidea Contribution No. 15.



Figs. 1-3. Lateral aspect of elytral declivity of *Platypus* spp.: 1, *disciporus*, female; 2, *pini*, female; 3, *pini*, male.

Figs. 4-5. Posterior aspect of elytral declivity of female *Platypus spp.*: 4, *disciporus;* 5, *pini.*

Figs. 6-8. Dorsal outline of *Platypus* spp.: 6, *disciporus*, female; 7, *pini*, female; 8, *pini*, male.

(Hopk. U. S. 5557), and *Pinus ponderosa* (Hopk. U. S. 5556a), all by J. L. Webb, and June 16, Hubbard and Schwarz; Flagstaff, *Pinus ponderosa* (Hopk. U. S. 5109, 5109b, and 5109c), J. L. Webb, and July 7, Hubbard and Schwarz; Pinal Mountains, Wickham; Rincon Mountains, Oct. 14, 1907, *Pinus ponderosa* (Hopk. U. S. 7164), and same data without host (Hopk. U. S. 7160), M. Chrisman; Santa Catalina Mountains, Sept. 26, 1907, *Pinus ponderosa* (Hopk. U. S. 5603b5), and *Pinus ponderosa* (Hopk. U. S. 5641b, and 5656b), all by J. L. Webb; and Williams, June 2, Barber and Schwarz. *New Mexico*: Captain Mountains, Sept. 7, 1907, *Pinus ponderosa* (Hopk. U.S. 5520k), *Pinus ponderosa* (Hopk. U.S. 3919a), and *Pinus* (Hopk. U. S. 5599), all by J. L. Webb; Cloudcroft, *Pinus ponderosa* (Hopk. U. S. 3984), W. F. Fiske; and Meek, *Pinus ponderosa* (Hopk. U. S. 3926).

Platypus abietis, n. sp.
Figs. 9-11

This species is closely allied to *wilsoni* Swaine, but in the male is decidedly smaller, has more slender, more elongate processes at elytral apices, and has the frons and declivity more finely sculptured. The female, in addition to being smaller than the female of *wilsoni*, has the porous area of the pronotum smaller, more anterior, and much less densely punctured, and has a different posterior profile as seen from dorsal aspect.

Male. — Length 4.3 mm., 4.4 times as long as wide; color dark brown (Fig. 10).

Frons feebly impressed, less strongly than *wilsoni*, and rather finely granulate. Vestiture similar to *wilsoni*, but slightly shorter, and of more uniform length. Eyes and antennae as in *wilsoni*.

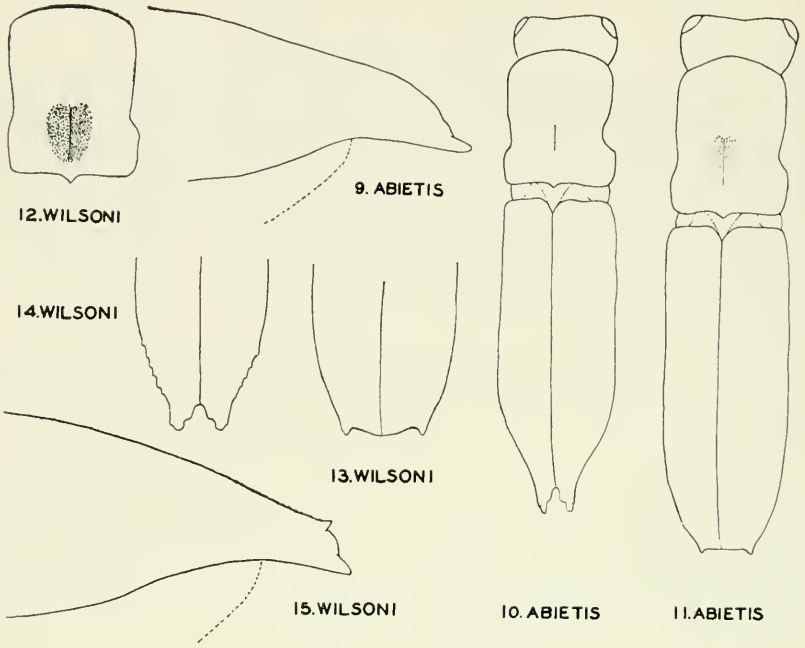
Pronotum 1.2 times as long as wide, wider on basal one-third; surface smooth and shining, except reticulate along basal margin and on anterior one-third, and covered by abundant minute pores and small shallow punctures, the punctures becoming larger and more obscurely impressed anteriorly. Scanty vestiture visible only near anterior margin. Median line rather strongly impressed along the second one-fifth of the length from the base (Fig. 10).

Elytra 2.5 times as long as wide, 2.2 times as long as pronotum; striae narrowly impressed, somewhat more shallowly and the punctures more distinct than in *wilsoni;* interstriae smooth and shining, becoming reticulate anteriorly, the punctures minute, scarcely larger than the numerous submicroscopic pores. Declivity (Fig 9) about as in *wilsoni*, except tubercles greatly reduced in size and number, those on the eighth interspace small, those on the ninth a little larger and more abundant and extending much further anteriorly (a few scattered to elytral base as in *wilsoni*); terminal process longer and more slender than in *wilsoni*, the dorsal tooth obsolete. Declivital vestiture shorter and less abundant than in *wilsoni*.

Female. — Frons rather strongly concave, closely punctured with rather abundant moderately long vestiture, essentially the same as *wilsoni*. Median line of pronotum beginning just behind middle and extending about three fourths of the distance to the base; porous area oval, beginning at anterior end of median line and extending about one-half the distance to base, about thirty medium sized pores on each side of median line. Elytral interspaces more evenly arched, the striae less sharply defined than in male. Posterior outline as figured (Fig. 11).

Type Locality. — Oak Creek Canyon, Millard Co., Utah.

Host. — *Abies concolor*



Figs. 9-11. *Platypus abietis*: 9, lateral aspect of male declivity; 10, dorsal aspect of male; 11, dorsal aspect of female.

Figs. 12-15. *Platypus wilsoni*: 12, dorsal aspect of female pronotum; 13, dorsal aspect of female declivity; 14, dorsal aspect of male declivity; 15, lateral aspect of male declivity.

Type Material. — The male holotype, female allotype and thirty-six paratypes were taken at the type locality on April 26, 1958, from the base and roots of a large white fir, by S. L. Wood and D. E. Bright. Forty additional paratypes were taken from the following localities: the type locality, Aug. 4, 1957, by D. E. Johnson; Chiricahua Mountains, Arizona, Sept. 18, 1907, Hopk. U. S. 5548b, 5549a; Santa Catalina Mountains, Arizona, Hopk. U. S. 5721a, J. L. Webb; Williams, Arizona, Barber and Schwarz; Captain Mauntains, New Mexico, Sept. 8, 1907, Hopk. U. S. 5509b, J. L. Webb; Cloudcroft, New Mexico, Hopk. U. S. 7204, and Hopk. U. S. 3978; and Las Vegas, New Mexico, Sept. 8, Barber and Schwarz. The holotype, allotype and some paratypes are in the collection of the writer; other paratypes are in the U. S. National Museum.

MAR 1 3 1959
HARVARD

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A NEW SPECIES OF *MALLOPHORA* FROM THE GREAT SALT LAKE DESERT (DIPTERA: ASILIDAE)[1]

D. Elmer Johnson[2]

During the course of an ecological study of the southern extention of the Great Salt Lake Desert of Utah, a number of apparently undescribed species of insects have come to light. One of these, a fly of the family Asilidae, is described below.

Mallophora (*Mallophorina*) *pallida*, n. sp.

Male: Head silvery gray pollinose, somewhat less densly so on the upper front. Pile of lower side of first and all of second antennal segments black, rest of hair of head white. First and third antennal segments black, second segment brown. Antennal style two-thirds as long as third segment. Palpi red.

Thorax silvery white pollinose, that on upper part of sternopleura, mesopleura, and mesonotum very pale stramineous, rest of vestiture of thorax white.

Coxae black, silvery white pollinose, white haired. Trochanters shining black, narrowly red basally and apically, hairs white. Femora shining black, narrowly red basally and apically, the fore and middle pairs also red ventrally; the heavy spines mostly black, rest of hair white. Tibiae reddish yellow, a pre-apical spot of black on front of fore tibiae. Most of the apical bristles on all pairs, and pile on outer distal third of hind pair black, pale golden yellow pile on inner side of first and reddish golden pile on outer side of hind tibiae; rest of vestiture white. Tarsi red, mixed black and white hairs on fore, black on middle, and mixed black and golden on hind pairs.

Wings very pale brownish hyaline, somewhat darker anteriorly, a few white hairs along base of costa; veins light brown basally, darker distally. First posterior cell open at the wing margin by about two-fifths the distance across the widest part of the cell. Stem of halteres pale brown, knob pale lemon yellow.

Abdomen black in ground-color, hind margins of tergites five, six, and seven narrowly pale; cinereous pollinose posterior border relatively broader on each successive segment after the second; sides and venter completely pollinose. Pile of first segment snowy

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white, of dorsum of rest of abdomen very pale stramineous, of sides and venter nearly white. Genitalia mostly reddish yellow, white haired.

Female: Much like the male. Second antennal segment black. Pile of mesonotum and dorsum of abdomen nearly white. Nearly all spines of middle and fore femora are white. Eighth tergite is black dorsally and apically. The females are usually somewhat larger than the males.

Specimens of both sexes range from 8-11 mm. in length.

Types: Male *holotype* and female *allotype*: West side of Little Granite Mountain, Tooele County, Utah, August 21, 1955 (D. E. Johnson). *Paratypes*: Millard County: 6♂6♀ 9 miles east of Delta, August 4-19 (D. E. Johnson). Tooele County: 3♂6♀ same locality as types, August 19-September 1 (D. E. Johnson); 5♂7♀ southeast end Cedar Mountains, July 23-August 21 (P. D. Ashlock, R. Holliman, D. E. Johnson); 2♀ Cane Springs, Cedar Mountains. August 10 (D. E. Johnson). The holotype, allotype and some paratypes are in the collection of the writer, other paratypes are in The collections of the U.S. National Museum, Brigham Young University and the University of Utah.

Except for size there seems to be very little variation in the group of specimens. Some of the males have a few black hairs in the lower edge of the mystax, on the tips of the palpi, and on the vertex. One or two have all segments of the antennae black. One has the third, as well as the second, antennal segment brown.

In Prichard's key to the species of the subgenus *Mallophorina* Curran[3] this species runs to *M. frustra* Pritchard. It differs from that species by the generally paler color of the vestiture, by the far more extensive black ground-color of the femora, and by the fewer or total lack of black hairs on the posterior part of the mesonotum, palpi, and lower mystax. The wings of this species are also much paler than are those of *M. frustra*.

The types were collected in an area of vegetated dunes on the upper edge of a scattered stand of junipers, *Juniperus osteosperma* (Torr.) Little, on the western slopes of Little Granite Mountain, a small, semi-isolated desert mountain on the eastern edge of Dugway Valley, central Tooele County, Utah. The elevation at which they were collected is about 4,600 feet above sea level. The principal vegetation is *Eriogonum dubium* Stark and various species of *Chrysothamnus*. All specimens of these flies were found resting on sticks, dry twigs, or directly on the dry, sandy ground. When netted, one specimen had in its grasp a small Megachilid bee. The Millard County specimens were collected in a dune area some nine miles east of Delta. The shrubbery here is composed of *Artemisia tridentata* Nuttall and various species of *Chrysothamnus*.

3. Pritchard, A. Earl. 1935. New Asilidae from the Southwestern United States (Diptera). American Museum Novitates No. 813.

A NEW SPECIES IN THE GENUS *NEOTENERIFFIOLA* FROM UTAH (ACARINA: ANYSTOIDEA: TENERIFFIIDAE)

Ted Tibbetts[1]

Thor (1911) erected the family *Teneriffiidae* for two new genera, each with a single species. The genus *Teneriffia* for *Teneriffia quadripapillata* collected on the island of Teneriffe and the genus *Parateneriffia* for *Parateneriffia bipectinata* collected in Paraguay.

Hirst (1924) erected another genus, *Neoteneriffiola* for the species *Neoteneriffiola luxoriensis* collected in Egypt and in 1925 he erected the genus *Heteroteneriffia* for the species *Heteroteneriffia marina* collected in Malay.

Womersly, (1935 erected a new sub-family *Rhaginae* and a new genus *Rhagina* for the species *Rhagina protea* collected in South Australia. He also, at the same time, erected the genus *Austroteneriffia* for the species *Austroteneriffia hirsti*, a group of five specimens Hirst had previously labelled *Neoteneriffiola*.

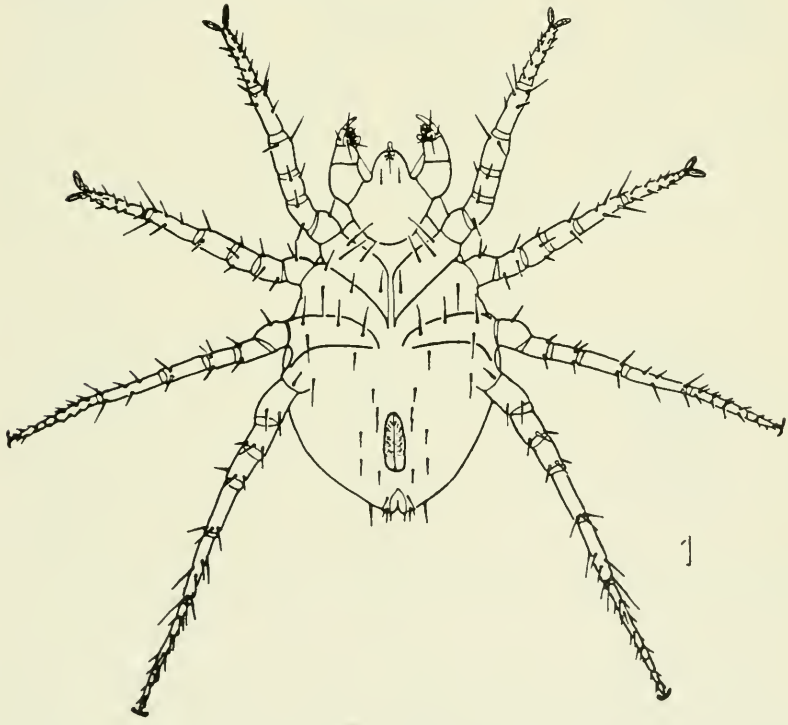

PLATE I

In this paper I would like to present a second species in the genus *Neoteneriffiola* collected in Utah.

1. Biology Department, Grand County High School, Moab, Utah.

Neoteneriffiola uta, n. sp.

Female: Body length including gnathosoma 1015u and body width 580u.

Venter: (Fig. 1, Plate I). Setae on venter few in number. On opisthosomal region, posterior to coxae IV and anterior to the anal area are six pairs of setae. Genital opening 130u from posterior margin; 159u long and 66u wide. Six pairs of short setae on each genital flap. Three pairs of genital suckers can be seen through the integument of the genital flap. Anal opening as figured with three pairs of lateral setae.

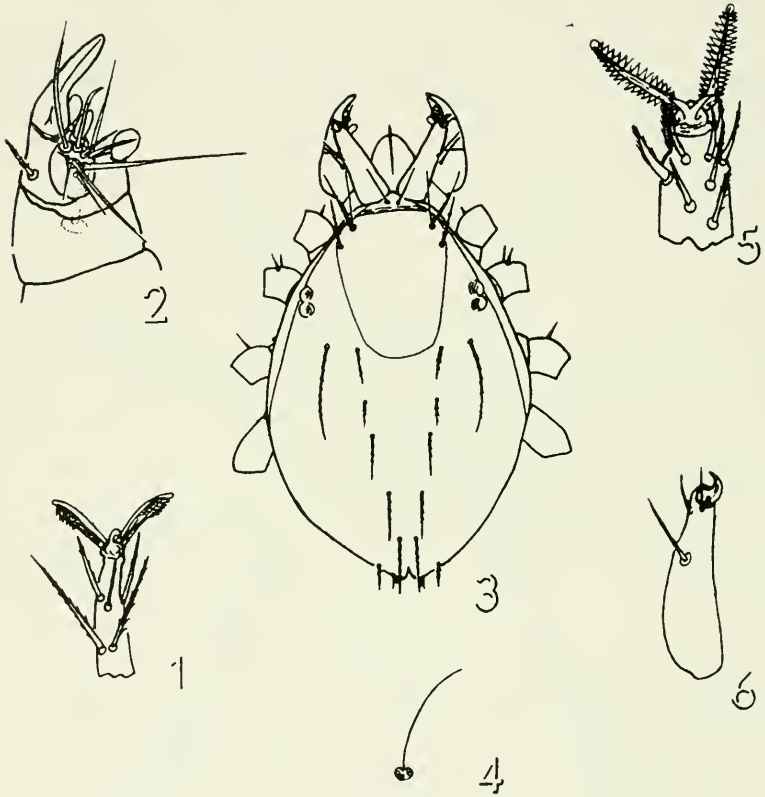

Plate II

Dorsum: (Fig. 3, Plate II). Lightly sclerotized dorsal plate present as figured with two pairs of setae and one pair of pseudostigmatic organs on the anterior lateral margin (Fig. 4, Plate II). Anterior to the dorsal plate, at the base of the chelicerae, is one pair of setae. Even with Coxae II are two pairs of lenslike eyes. On the opisthosomal area are seven pairs of setae as figured.

Legs: Long and slender. Chaetotaxy of ventral side of legs as figured. Coxae I with four setae; coxae II with three setae; coxae

III with four setae and coxae IV with three setae. Tarsal claws on leg I and II strongly pectinated with a bifurcate empodium (Fig. 5, Plate II). Tarsal claws on leg III and IV weakly pectinated with a claw-like empodium. (Fig. 1, Plate II).

Gnathosoma: Gnathosoma short and broad; on ventral side is one pair of setae even with the anterior margin of palpal coxae. Two pairs of short papillae are present on anterior margin of gnathosoma. Palpus with five segments; second segment with one dorsal seta, third segment with one long dorsal seta and a thumb like process; fourth segment with one short ventral feathered seta, two stout dorsal spinules near the strong terminal claw; fifth segment very small with nine setae as figured (Fig. 2, Plate II). Chelicerae sicklelike with three setae and a short curved claw on distal end (Fig. 6, Plate II).

Male: Unknown.

Location: Moab, Utah, 4 April, 1955; collector T. Tibbetts.

Material: Holotype: female deposited in the U.S. National Museum. One paratype female retained in author's collection.

Remarks: Holotype female collected at Moab, Utah, 4 April, 1955 and paratype female collected at Green River, Utah, 11 April, 1955 under rocks. *Neoteneriffiola uta* differs from *Neoteneriffiola luxoriensis* in that the dorsal median setae I, II and III, posterior to the lens-like eyes are short and do not reach the base of the next pair; fourth segment of palpi with a short ventral feathered seta and fifth segment with nine setae.

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BARK BEETLES OF THE GENUS *PITYOBORUS* BLACKMAN (COLEOPTERA: SCOLYTIDAE)

Stephen L. Wood[1]

The genus *Pityoborus* was described by Blackman (1922) to include *Crypturgus comatus* Zimmermann from the southeastern United States. He later added *Pityoburus secundus* (1928) from Utah, and *P. tertius* (1942) from the Federal District of Mexico. In the following pages four previously undescribed species from Mexico are added to the genus.

The writer has been privileged to observe in the field and to collect all seven of the species included here. Because of their characteristic gallery patterns the presence of representatives of this genus in an area is easily detected. Only a fraction of the types of *Pityoborus* galleries observed in the field yielded specimens for study, therefore, it is believed that many more species eventually will be added to the genus from Mexico.

The beetles attack the small shaded-out, party living, lower branches of standing pine trees. The writer has never taken specimens or observed galleries in slash or broken branches, or in material larger than three inches in diameter. Because of this habit they are not considered as having economic importance, unless the acceleration of natural pruning is regarded as being beneficial. The gallery system engraves the wood rather deeply and consists of a central nuptial chamber from which two transverse egg galleries extend in opposite directions. In small branches the egg tunnels may spiral slightly in order to avoid contact where they overlap at their extremities. For the most part, egg niches were not present in galleries of the first three species listed in the key; in the others they appeared large, but shallow, and irregular in arrangement. Typically the egg niche is enlarged, or a side gallery constructed, by the larva to form a short feeding tunnel that may be as long as 10 or 12 mm., but usually is just long enough and broad enough to accommodate the adult beetle and in this respect, although irregular in size, they resemble somewhat the larval cradles of the Corthylini and Xyloterini. In addition to these galleries, several feeding tunnels may arise from the nuptial chamber and extend in any direction; their length and number apparetly depend on the length of time the gallery system is inhabited and on the number of occupants. In one species (*intonsus*) the longitudinal feeding tunnel was almost twice the combined lengths of the egg galleries. Special pupation tunnels, as described and figured by Blackman for *comatus*, have not been observed in the six other species except *tertius*. The species are all believed to be monogamous. An occasional second female may be found in a system of galleries; however, these are presumed to be accidental entrants, or more probably the offspring of the original pair, since both parents and young occupy the same tunnels.

1. Department of Zoology and Entomology, Brigham Young University, Provo, Utah. Contribution No. 161, Scolytoidea Contribution No. 16

Pityoborus Blackman

Pityoborus Blackman, 1922, Mississippi Agric. Expt. Sta. Tech. Bull. 11:96; Blackman, 1928, Bull. New York College For. (Syracuse) Tech. Pub. 25:145; Chamberlin, 1939, The Bark and Timber Beetles of North America North of Mexico, p. 343.

Description.—Length 1.7-3.2 mm., about 2.5-2.8 times as long as wide; body color brownish. Frons usually sexually dimorphic, either flat or concave, and ornamented or not by hair of variable length, density and arrangement; eye emarginate; antennal funicle five-segmented, the club large, at least twice as long as the funicle, its first two sutures septate. Pronotum about 0.9-1.0 times as long as wide, not impressed behind the summit; anterior third asperate with the anterior margin armed by about 12-18 serrations of equal size; surface of posterior half reticulate and punctured; lateral areas on anterior two-thirds bearing in the female a pair of yellowish plushlike pubescent patches. Elytra finely sculptured; strial punctures in rows or not, the interstrial punctures greatly reduced in number; declivity variable, the second interspace feebly widened and depressed or not, the first and third interspaces usually with a few small setiferous granules. Vestiture hairlike.

Type Species.—*Crypturgus comatus* Zimmermann (monobasic).

Key to the Species of *Pityoborus*

1. Female frons concave from eye to eye, the cavity margined by a dense row of long curved setae; elytral striae not impressed, the punctures of rows one and two confused or at least in very irregular rows (if character indefinite, male frons with frontal setae as in female). 2

   Female frons flat or weakly impressed on a narrow median area, and bearing rather sparse setae only slightly longer on margin; elytral striae often weakly impressed, the punctures in definite rows; male frons never with conspicuous brush of hair. 4

2. Length 2.0 mm.; both sexes with brush of frontal setae; first declivital striae feebly impressed, the third interspace not elevated. ..... *velutinus*, n. sp.

   Length 2.8 mm. or larger; brush of frontal setae only in female; second declivital interspace flat, impressed, third interspace weakly elevated; patch of pubescence on female thorax proportionately smaller. 3

3. Smaller, 2.9 mm.; pubescent patches on female pronotum almost round, smaller, more widely separated from one another, and yellow in color; elytral pubescence shorter and less abundant; male frons with median elevation almost obsolete. ..... *hirtellus*, n. sp.

   Larger, 3.2 mm.; pubescent patches on female pronotum ovate, with the narrow point dorsad, larger, less widely separated, and reddish-yellow in color; elytral pubescence longer and

more abundant; male frons with a distinct, narrow median elevation. ..... *rubentis*, n. sp.

4. Antennal club larger and broad, 1.3 times as long as wide; slightly smaller species, usually not more than 2.4 mm.; pubescent area on female pronotum proportionately smaller. 5

   Antennal club smaller and more slender, at least 1.4 times as long as wide; slightly larger species, usually more than 2 6 mm.; pubescent area of female pronotum proportionately much larger. 6

5. Body smaller, 1.7-1.9 mm., and stouter, 2.7 times as long as wide; posterior half of pronotum rather smooth, moderately shining, and rather coarsely and deeply punctured; first declivital striae impressed, third interspace not elevated. ..... *comatus* (Zimmermann)

   Body larger, 1.9-2.6 mm., and more slender, 2 8 times as long as wide; posterior half of pronotum more strongly reticulate, dull, and very finely, shallowly punctured; second interspace weakly impressed, third slightly elevated ..... *tertius* Blackman

6. Posterior half of pronotum rather closely, deeply punctured; pubescent areas on female pronotum slightly wider than long (less than 1 3 times); first and second declivital punctures usually obsolete, interspace two rather strongly impressed. ..... *secundus* Blackman

   Posterior half of pronotum feebly punctured; pubescent area on female pronotum much wider than long (1.6 times), very narrowly separated dorsally; first and second declivital striae reduced but visible, interspace two rather weakly impressed. ..... *intonsus*, n. sp.

Pityoborus velutinus, n. sp.

Fig. 1

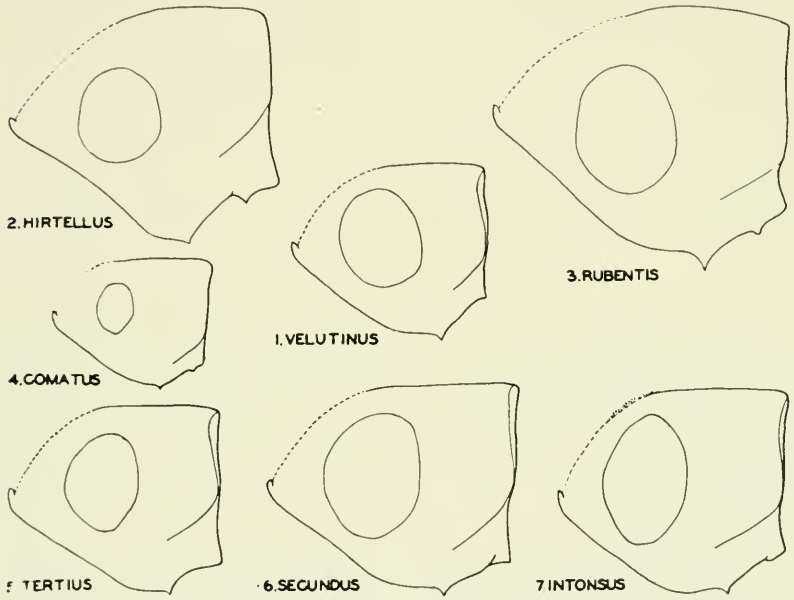
This species differs from all other representatives of the genus in having the declivity simple, almost entriely without modification of the second interspace, the declivital granules are scarcely visible, and the male frons bears a marginal fringe of long hair similar to, but less well developed, than in the female. The size will also serve to distinguish the female from other species having a concave frons.

Female.—Length 2 0 mm., 2.5 times as long as wide; body color brown.

Frons broadly, rather deeply concave from eye to eye and from epistomal margin to well above eyes; concavity smooth with a few minute punctures, and with a marginal fringe of long incurved hair, shorter along epistoma, comparatively longer above than the diameter of the concave area; central area of concavity with a few rather short inconspicuous setae. Antennal club large, ovate, 1.39 times as long as wide, first suture very weakly procurved, second moderately procurved

Pronotum 0.91 times as long as wide; sides of basal half weakly arcuate and very slightly converging anteriorly, anterior margin

very broadly, evenly rounded and armed by 18 rather large teeth of almost equal size; anterior area moderately asperate, more finely at summit, summit area not impressed behind; posterior areas reticulate, dull, finely, shallowly punctured; slightly more than the middle third of the length and from lateral margin to about three-fourths of the distance to median line (dorsal aspect) occupied on each side by a patch of dense, plushlike, yellow pubescence (Fig. 1), each patch slightly wider transversely than long (about 1.26 times), the two patches separated dorsally by the length of one patch.



Figs. 1-7. *Pityoborus* spp., lateral aspect of female prothorax: 1, *velutinus;* 2, *hirtellus;* 3, *rubentis;* 4, *comatus;* 5, *tertius;* 6, *secundus; and* 7, *intonsus.*

Elytra 1.6 times as long as wide, 1.7 times as long as the pronotum; sides straight and subparallel on basal three-fourths, moderately rounded behind; striae not at all impressed, the punctures small, shallow, rather obscure, moderately confused on striae one and two; interstriae minutely subcrenulate, rather dull, the punctures reduced greatly in size and irregular in spacing. Declivity steep, evenly rounded; first striae weakly impressed, the punctures greatly reduced and scarcely visible on rows one and two, small but more evident on others; interstriae with rows of minute punctures, those on first evidently very feebly granulate. Strial punctures each bearing a minute microseta, interstrial punctures with erect bristles more abundant and slightly longer on sides and declivity, the longest bristles about equal in length to distance to nearest bristle in any direction.

Male.—Similar to female except: frons flat, gradually elevated

toward epistomal margin, marginal fringe of setae reduced in number and length of the hairs, the longest slightly less than a distance equal to the diameter of the frontal area, the ring of hairs not entirely complete above; pubescent patches on sides of pronotum absent; and very minute granules evident on declivital interstriae one and three.

Type Locality.—Fourteen miles northwest of Guadalajara, Jalisco, Mexico.

Host.—*Pinus* sp.

Type Material.—The female holotype, male allotype and 37 paratypes were collected at the type locality on July 19, 1953, at an elevation of 5000 feet, by S. L. Wood. They were taken from a shaded-out branch of a mature dwarf(?) pine about 20 feet in height, and were associated with *hirtellus*. Galleries of this species were not fully developed; the egg niches were few in number and very minute

The holotype, allotype and some paratypes are in the Snow Entomological Collection, other paratypes are in the collection of the writer.

Pityoburus hirtellus, n. sp.
Fig. 2

This species is more closely allied to *rubentis* than to other species of the genus, but may be distinguished by the smaller size, by the less strongly impressed second declivital interspace and more finely developed tubercles on interspaces one and three, and by the different color and shape of the pubescent patches on the female thorax.

Female.—Length 2.9 mm., 2.5 times as long as wide; body color reddish-brown.

Frons broadly, rather deeply concave from eye to eye and from epistomal margin to well above eyes; concavity smooth, with a few minute punctures, and with a marginal fringe of long incurved hair, shorter along epistoma, comparatively longer above than the diameter of the concave area; central area of concavity with a few rather short inconspicuous setae. Antennal club oval, 1.36 times as long as wide, sutures one and two about equally, weakly arcuate; widest through segment three.

Pronotum 0.93 times as long as wide; sides on basal half weakly arcuate and very slightly converging anteriorly, anterior margin broadly, evenly rounded and armed by 18 rather small teeth of almost equal size; anterior area moderately asperate, more finely at summit; summit area not impressed behind; posterior areas reticulate, dull, finely, shallowly punctured; slightly more than the middle third of the length and from lateral margin to about one-half of the distance to the median line (dorsal aspect) occupied on each side by a patch of dense, plushlike, yellow pubescence (Fig. 2), each patch almost circular in outline (1.1 times as wide as long) and separated from one another by about twice the diameter of one patch.

Elytra 1.8 times as long as wide, 1.8 times as long as the pronotum; sides straight and subparalled on basal three-fourths, moderately rounded behind; striae not at all impressed, the punctures small, shallow, moderately confused on striae one and two; interstriae dull, evidently very minutely subcrenulate or punctate, the punctures greatly reduced in size and number. Declivity steep; interspace two impressed, one and three weakly elevated and armed by several small, blunt tubercles; strial punctures greatly reduced but visible. Strial microsetae not evident except on sides where not destroyed by abrasion; interstrial bristles erect, rather short and very sparse on disc, much longer and more abundant on sides and declivity, some about one and one-half times as long as the distance between rows of bristles.

Male.—Similar to female except: frons flat, gradually elevated toward epistomal margin, marginal fringe of setae absent; pubescent patches on sides of pronotum absent; and declivital tubercles more prominent.

Type Locality.—Fourteen miles northwest of Guadalajara, Jalisco, Mexico.

Host.—Pinus sp.

Type Material.—The female holotype, male allotype and one female paratype were collected at the type locality on July 19, 1953, at an elevation of 5000 feet, by S. L. Wood. They were taken from one gallery system in the same branch as *velutinus*. The gallery system was not as fully developed as might have been expected; two larval cradles appeared complete, two were about half developed, and the two egg niches were undeveloped. The three specimens represent one mature female and her two somewhat callow young.

The holotype and allotype are in the Snow Entomological Collection, and the paratype is in the collection of the writer.

Pityoborus rubentis, n. sp.
Fig. 3

This is the largest known species in the genus. It is more closely allied to *hirtellus* than to other representatives of the genus, but is readily distinguished by the reddish-yellow color of the pubescence, by the more coarsely sculptured elytral declivity, by the median frontal elevation of the male, and by the smaller, ovate pubescent patches on the thorax of the female.

Female.—Length 3.2 mm., 2.6 times as long as wide; body color reddish-brown.

Frons broadly, rather deeply concave from eye to eye and from epistomal margin to well above eyes; concavity smooth with a few minute punctures, and with a marginal fringe of long curved hair, the hair much shorter on epistoma and longer above than in the allied species; central area of concavity with a few rather short inconspicuous setae. Antennal club oval, 1.28 times as long as wide.

sutures one and two about equally, weakly arcuate; widest through segment three.

Pronotum 0.96 times as long as wide; sides on basal half weakly arcuate, widest just behind middle, anterior margin rather broadly rounded and armed by 18 rather small teeth of somewhat irregular size; anterior area moderately asperate, more finely at summit; summit area not impressed behind; posterior areas reticulate, dull, finely, shallowly punctured; slightly more than middle third of the length and from lateral margin to about one-half of the distance to the median line (dorsal aspect) occupied on each side by a patch of dense, plushlike, reddish-yellow pubescence (Fig. 3), each patch subovate, narrower above, 1.3 times as wide as long, and separated from one another by about twice the diameter of one patch.

Elytra 1.6 times as long as wide, 1.8 times as long as the pronotum; sides straight and subparallel on basal three-fourths, moderately rounded behind; striae not impressed, the punctures rather small, shallow, confused on striae one and two, interstriae dull, evidently very minutely subcrenulate or punctate, the interstrial punctures reduced in number, distinguished from strial punctures by the presence of a bristle. Declivity steep; interspace two impressed, one and three weakly elevated and armed by several moderately large tubercles; strial punctures reduced in size but visible. Strial microsetae not evident except on sides where not destroyed by abrasion; interstrial bristles erect, rather short and sparse on disc, much longer and more abundant on sides and declivity, some about one and one-half times as long as the distance between rows of bristles.

Male.—Similar to female except: frons weakly convex, epistomal margin elevated, a rather broad median carina extending from epistomal margin to above eyes, marginal fringe of hair reduced to a few long setae at sides on lower half, surface coarsely, rather closely punctured except along carina; pubescent patches on sides of pronotum absent; and declivital tubercles evidently somewhat larger.

Type Locality.—Fourteen miles west of Texmelucan, Puebla, Mexico.

Host.—Pinus sp.

Type Material.—The female holotype, male allotype and one female paratype were collected at the type locality on July 14, 1953, at an elevation of 8600 feet, by S. L. Wood. They were taken from one gallery system in a shaded-out branch one and one-half inches in diameter. The galleries lacked egg niches and the larval galleries were a maximum of 10 mm. long; there were no other feeding tunnels.

The holotype and allotype are in the Snow Entomoligical Collection, and the paratype is in the collection of the writer.

Pityoborus comatus (Zimmermann)

Fig. 4

Crypturgus comatus Zimmermann, 1868, Trans. American Ent. Soc. 2:143.
Cryphalus comatus, Leconte, 1868, Trans. American Ent. Soc. 2:155.
Pityophthorus comatus, Leconte, 1876, Proc. American Philos. Soc. 15:355.
Pityoborus comatus, Blackman, 1922, Mississippi Agric. Expt. Sta. Tech. Bull. 11:96-98, figs. 51-52, 79-80; Blackman, 1928, Bull. New York Coll. For. (Syracuse) Tech. Pub. 25:145, fig. 51; Chamberlin, 1939, The Bark and Timber Beetles of North America North of Mexico, p. 343.

This is the smallest known species in the genus and the only one that occurs in the eastern half of the United States. The characters given in the key will serve to distinguish it from allied species. Blackman (1922, 1928) described and figured both the male and female and the galleries.

It is 1.7-1.9 mm. long, 2.7 times as long as wide; antennal club 1.28 times as long as wide; pronotum equal in length and width, the pubescent patches (Fig. 4) each 1.36 times as wide as long; elytra 1.7 times as long as wide, and 1.7 times as long as pronotum.

Type Locality.—South Carolina.

Hosts.—*Pinus* spp.

Distribution.—Southeastern United States from North Carolina south to Florida, and west to Mississippi. Specimens taken by the writer were from the following localities. *North Carolina*: Cherokee. *Florida*: Big Pine Key, and Everglades National Park. *Georgia*: Kingsland.

Pityoborus tertius Blackman

Fig. 5

Pityoborus tertius Blackman, 1942, Proc. U.S. Natl. Mus. 92(3147): 202.

This Mexican species is distinguished from allied species by the characters mentioned in the key. As might be expected from its close relationship to that species, its galeries resemble very closely those of *comatus* in their irregularity presumably caused by the "pupation" tunnels.

It is 1.9-2.6 (most specimens 2.3) mm. long, 2.8 times as long as wide; antennal club 1.34 times as long as wide; pronotum equal in length and width, the pubescent patches (Fig. 5) each 1.36 times as wide as long; elytra 1.9 times as long as wide, and 1.9 times as long as the pronotum.

Type Locality.—Chalco, D. F., Mexico.

Host.—*Pinus leiophylla*.

Distribution.—In addition to the type series, the writer took this species at 11 miles northeast of Jacala, Hidalgo, Mexico, on June 22, 1953, at an elevation of 5100 feet, from shaded-out branches about three-fourths to one and one-half inches in diameter.

Pityoborus secundus Blackman

Fig. 6

Pityoborus secundus Blackman, 1928, Bull. New York Coll. For. (Syracuse) Tech. Pub. 25:146; Chamberlin, 1939, The Bark and Timber Beetles of North

America North of Mexico, p. 345.

All previous references to this species were to the unique female type specimen. It is the only representative of the genus known to occur in the western half of the United States. It is readily distinguished from allied species by the larger pubescent patches on the thorax of the female and by the characters given in the key.

The gallery pattern includes regularly placed shallow egg niches, and larval cradles not more than 6 mm. long branching at right angles to the egg galleries. In addition, as many as five feeding tunnels, each not more than 10 mm. in length, may arise separately from the nuptial chamber.

It is 2.2-2.8 mm. (most specimens 2.7) long, 2.8 times as long as wide; antennal club 1.47 times as long as wide; pronotum equal in length and width, the pubescent patches (Fig. 6) each 1.3 times as wide as long; elytra 1.8 times as long as wide, 1.8 times as long as pronotum.

Male.—Previously unknown, but reported here for the first time.

Frons feebly convex, epistomal margin slightly elevated, median line raised, surface coarsely reticulate, indistinctly, rather shallowly and coarsely punctured, pubescence of a few scattered inconspicuous hairs; sides of pronotum feebly arcuate, subparallel on basal half, narrowly rounded in front, anterior magrin armed by 14-16 rather coarse teeth; posterior areas finely reticulate, almost shining, rather coarsely, closely and somewhat deeply punctured; strial punctures of moderate size, deep, close, in distinct rows; interstriae almost impunctate; declivity rather steep, second interspace rather strongly impressed, punctures of striae one and two virtually obsolete, interspaces one and three raised and each bearing about six rather coarse pointed tubercles; pubescence consisting of strial microsetae and interstrial bristles, confined largely to sides and declivity, longest declivital bristles not quite as long as distance between rows of bristles.

Type Locality.—LaSal Mountains, Utah.

Host.—Pinus ponderosa.

Distribution.—Known only from the LaSal Mountain area of Utah where it attacks the small shaded-out branches of healthy yellow pine. On July 5, 1958, the writer and D. E. Bright found it rather common at Two Mile Creek Canyon in the LaSal Mountains.

Pityoborus intonsus, n. sp.

Fig. 7

The last four species in the key form a very compact group. This species is readily separated from the other three by the transversely very broad pubescent patches on the female pronotum that are narrowly separated dorsally. Like *secundus*, the antennal club is slender, but it may readily be separated from that species by the more dull, less deeply, less closely punctured posterior areas

of the pronotum, and by the less strongly sculptured declivity.

Female.—Length 2.6 mm., 2.8 times as long as wide; body color dark brown.

Frons convex, except median third flattened or indistinctly impressed, epistomal area gradually raised, more strongly at margin; surface strongly reticulate and obscurely, rather coarsely punctured; vestiture inconspicuous, consisting of sparse fine hair, gradually becoming longer toward margin, but not forming a definite row. Antennal club rather slender, 1.42 times as long as wide; sutures one and two weakly procurved; widest through segment two.

Pronotum equal in length and width; sides weakly arcuate and converging slightly toward the moderately rounded anterior margin; anterior margin armed by 12 small teeth of subequal size the lateral pair minute; anterior area moderately asperate, more finely at summit, finely punctured between asperities; summit not impressed behind; posterior area reticulate, dull, finely and shallowly punctured; slightly more than the middle third of the length and from lateral margin to about five-sixths of the distance to median line (dorsal aspect) occupied by a patch of dense, plushlike, yellow pubescence (Fig. 7), each patch elongate-ovate, only slightly narrower above, about 1.6 times as wide as long, the two patches separated dorsally by half the length (longitudinally) of one patch.

Elytra 1.8 times as long as wide, 1.8 times as long as pronotum; sides subparallel on basal three-fourths, moderately rounded behind; striae not impressed, except basal half of one, the punctures small, rather deep, in definite rows; interstriae reticulate, impunctate. Declivity rather steep, evenly rounded, dull; interspace two impressed, one moderately and two weakly elevated, both armed by a few rather widely spaced setiferous granules; punctures of striae one and two greatly reduced but distinct. Vestiture of minute strial microsetae and long interstrial bristles; almost restricted to sides and declivity; the longest bristles about equal in length to the distance between rows of bristles.

Male.—Similar to female except: frons more nearly flattened, feebly convex, with a broad median elevation from epistoma to upper level of eyes, surface reticulate, finely punctured laterally; pubescent patches on thorax absent; and declivital granules slightly larger and the bristles slightly longer.

Type Locality.—Fourteen miles west of Texmelucan, Puebla, Mexico.

Host.—*Pinus* sp.

Type Material.—The female holotype, male allotype and one female paratype were taken at the type locality on July 14, 1953, at an elevation of 8600 feet, by S. L. Wood. These specimens were taken from one gallery system in the same shaded-out branch one and one-half inches in diameter as *rubentis*. These galleries are

peculiar in the length and pattern of the feeding tunnels. The combined lengths of the two egg galleries was 28 mm. From the nuptial chamber extended five feeding tunnels; four of these were simple in form and less than 15 mm. in length, the fifth was 40 mm. long and from it there arose in a regular pattern seven short lateral tunnels, each 3-8 mm. long, that curved so as to run parallel to the central tunnel. Only two niches, apparently for eggs, were present in the entire system; these were in the long feeding tunnel.

The holotype and allotype are in the Snow Entomological Collection, the paratype is in the collection of the writer.

A Wolverine in Utah

On the afternoon of July 6, 1958, Mr. D. E. Bright and myself were collecting insects at Geyser Pass in the LaSal Mountains at an estimated elevation of about 9,000 feet. At 3:30 p.m. we returned to the car which was directed down hill and, without starting the motor, released the brakes and coasted slowly down the narrow dirt road. On the north side of the road near the point of junction between sections three and four, Township 27 South, Range 24 East of the Salt Lake Meridian (about a mile below the Holy Oak Ranger Cabin) was a heavily grazed clearing in the aspen. This clearing extended about 125 yards from the road and was about 50 yards wide. On a mound of earth made by a Uinta Ground Squirrel just west of the center of the clearing a wolverine was crouched waiting for the squirrel to appear. When the animal spotted the car it immediately ran to the far (eastern) side of the clearing, angling slightly away from the road. It ran at least fifty yards in full view. The large size, stocky build, shortened tail, and typical mustelid gait left no room for doubting the identity of the animal. The light dorsolateral stripe was poorly developed and extended from the front shoulder only about half the distance to the base of the tail. —Stephen L. Wood.

TWO NEW SKINKS FROM DURANGO, MEXICO

Wilmer W. Tanner[1]

Among the reptiles secured in the state of Durango by the University of Kansas field survey under the direction of Dr. Rollin Baker, for the summer of 1955, are specimens belonging to two species of the genus *Eumeces*. Four specimens of *Eumeces lynxe* Wiegmann were taken approximately 30 miles east of El Salto, and seven specimens of *Eumeces brevirostris* Gunther were collected 9-15 miles southwest of El Salto. Both species were taken during the last week of June, while the area was still relatively dry. We worked these same areas during the first week of September (rainy season) 1957, without finding a single skink. Although *E. brevirostris* has been taken previously in southern Durango (Coyote), the discovery of *E. lynxe* is a substantial range extension for this species.

A careful examination of these specimens has demonstrated a modification of several characteristics which marks them as distinct geographic subspecies.

Eumeces lynxe durangoensis, n. subsp.

Fig. 1

Type.—An adult female, KU 044737, taken approximately 30 miles east of El Salto, Durango, Mexico. Collected by C. M. Fugler, June 30, 1955.

Paratypes—KU 044734-5 topotypes and KU 044736 taken approximately 10 miles east of El Salto, Durango.

All types are in the vertebrate collection of the University of Kansas Museum of Natural History.

Diagnosis.—A moderate to small form with the tail approximately 60 per cent of the total length. Median stripe extending from the shoulders to the frontal plate where it terminates without bifurcating. Lateral stripe absent and dorsolateral stripe distinct anteriorly but becoming faint at middle of body and obsolete posteriorly. Seven superciliaries, the anterior one in broad contact with the prefrontal, frontonasal nearly as long as wide and the postloreal noticeably longer than high.

Description of type.—Rostral normal, in broad contact with the first supralabials, nasals, and internasals; two internasals followed by a frontonasal slightly wider than long and in wide contact with the frontal; prefrontals larger than internasals and in contact with both loreals, first superciliaries, first supraoculars, frontonasal and frontal; four supraoculars, second largest; seven superciliaries, first and seventh largest, first in broad contact with prefrontal, seventh higher than long, and forming a broad contact with fourth supraocular; frontal large, widest anteriorly, rounded posteriorly and in contact with the first three supraoculars; frontoparietal smaller than interparietal and in broad contact; parietals large, nearly enclosing the smaller interparietal; nasal elongate, divided and with the nostril near its middle; postnasal absent; anterior loreal higher than long.

1. Contribution No. 162, Department of Zoology and Entomology, Brigham Young University.

clearly visible from dorsum; posterior loreal longer than high, narrowly in contact with second supralabial and widely separated from the fourth; two subpreoculars, upper twice the size of lower; three preoculars, first large, third very small; three subpostoculars, third largest, first smallest, two small subequal postoculars; primary temporal in broad contact with third presubocular and lower secondary

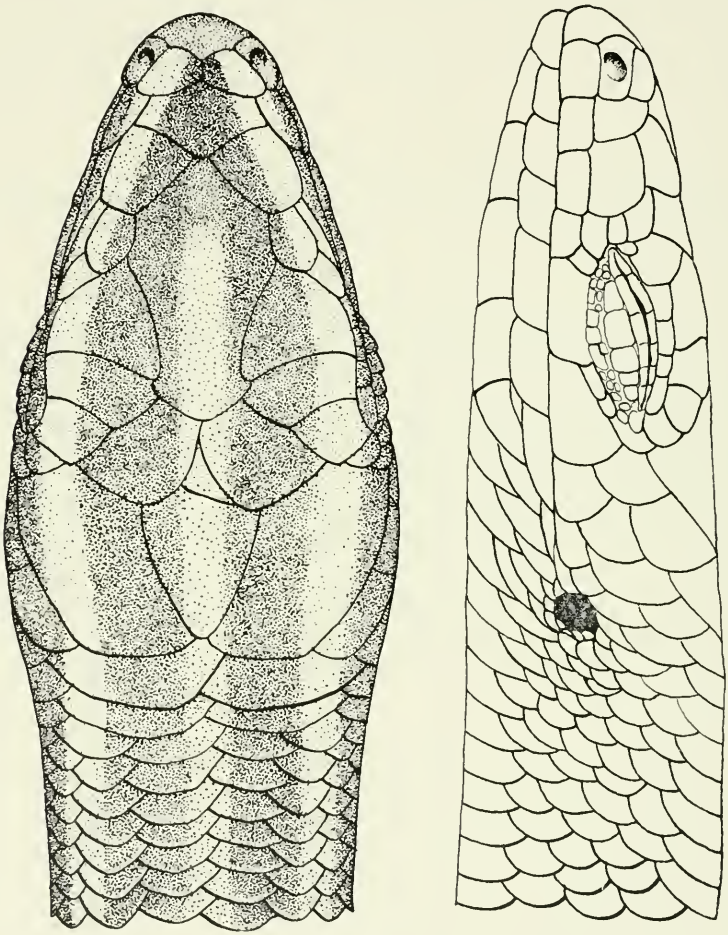


Fig. 1. Dorsal and lateral head view of type, showing scale and color patterns in *Eumeces l. durangoensis*.

temporal, equal in size to latter; upper secondary temporal large, twice size of primary scute, and widely separated from seventh supralabial; one high narrow tertiary temporal, separated from auricular boarder by a small scale, auricular lobules absent; seven supralabials, sixth distinctly larger than seventh, fourth smallest;

one narrow high postlabial separated from auricular opening by a pair of small secondary postlabials; two pair of nuchals, anterior pair distinctly longer. Mental large, extending to middle of first supralabial; one postmental and three pair of chinchields, followed by an elongate post-genial, six lower labials, sixth longest.

Dorsal scales between parietals and base of tail, 62; ventrals, 48; scale rows at middle of body, 24; lamallar formula of fingers: 5 7 8 10 6, of toes: 5 7 10 12 8; three enlarged papillated scutes boarder the heel.

Ear opening small nearly round and approximately equal distance from eye, as eye to snout; length of eye less than distance from eye to nostril; adpressed legs separated by 16 scales; total length 132 mm; snout to vent 53 mm.

Color and Color pattern.—Ground color above a brownish olive from the shoulders posteriorly, darker brown anteriorly and with a series of seven light and dark longitudinal stripes extending from head onto body; tail unstriped; median stripe straight, extending from approximately middle of frontal posteriorly on inner edge of each median scale row to the seventeenth scale of each row where it is no longer distinct; anterior bifurcation completely lacking; between the dorsolateral and medial stripes on the head a dark brown stripe extends onto body, where it becomes lighter in its middle, producing, for a short distance, dark margins for both the medial and dorsolateral light stripes; dorsolateral stripes extending from rostral posteriorly across the supraoculars and onto the second, and second and third scale rows, rapidly fading posterior to the shoulders to blend with the brownish-olive area between the dark lateral stripes; extending from the nasal along the side of head and to the tail along the fourth and fifth scale rows is a dark brown stripe, between the legs its ventral edge fades until a blend with the lighter ventral color occurs; immediately posterior to the ear and extending to the front leg is the faded indistinct lateral stripe; lateral stripe absent between legs; gular, throat and chest cream colored; abdomen bluish-gray.

Range.—Known only from the mountains east of El Salto, Durango, Mexico.

Remarks.—A comparison of the *durangoensis* series with data gathered from museum specimens and with a typical *l. lynxe* (BYU 651) from Jacala, Hidalgo, indicates that the new subspecies is more closely related to *l. lynxe* than to *l. furcirostris*, but is distinct from both in lacking the anterior bifurcation of the median stripe, as well as a distinct lateral stripe and in having an overall fading of the longitudinal stripe from anterior to posterior. Also, the sixth supralabial is equal to or distinctly larger than the seventh.

The paratypes are similar to the type in every respect. In size the type is the largest at 53 mm and the smallest paratype is 47 mm from snout to vent.

Eumeces brevirostris bilineatus, n. subsp.

Fig. 2

Type.—An adult male, KU 044732, taken approximately 10

miles southwest of El Salto, Durango, Mexico. Collected by C. M. Fugler, June 28, 1955.

Paratypes.—KU 044728, 044730-1, 9 miles SW El Salto; KU 044726, 044729, topotypes; KU 044727, 15 miles SW El Salto; CNHM 1506 (3) Coyote, Durango; USNM 64666, Sierra de Jaunocatlan, La Laguna, Jalisco; MMZ 117756, Mojarachic, Chihuahua, Mexico

All types are in the vertebrate collections of the University or Museum indicated above.

Diagnosis.[2]—Dorsolateral stripe distinct from rostral to the base of the tail. Lateral stripe absent and with the lighter ventral color

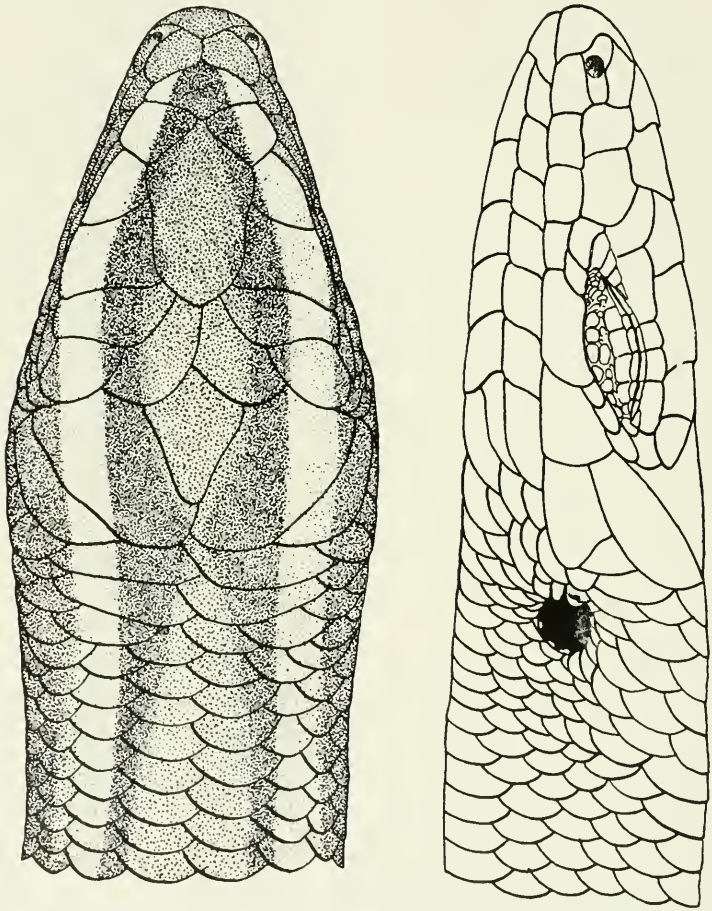


Fig. 2. Dorsal and lateral head view of type, showing scale and color patterns in *Eumeces brevirostris bilineatus.*

2. Richard G. Zweifel (Herpetologica 10:145) reports a series of fifteen specimens from Durango and Chihuahua. The data presented does not indicate any variation from that obtained from the type series.

blending with the lower edge of the lateral dark stripe. The seventh supralabial and upper secondary temporal very large and in broad contact. Primary temporal or lower secondary temporal missing and when present small. Interparietal small, deeply enclosed by the parietals and widely separated from the frontal. The latter scute is large and in narrow to wide contact with the frontonasal which is nearly twice as wide as long. Adpressed legs are separated by 2-10 scales in adults.

Description of type.—Rostral normal and moderate in size; internasals in broad contact medially; frontonasal nearly twice as wide as long; prefrontals normal in size, narrowly divided medially by the frontal, first supraocular and first superciliary in broad contact with its posterior margin; four supraoculars, second largest; frontal large, rounded posteriorly and in contact with first three supraoculars; frontoparietals large, in wide contact medially; interparietal small, approximately equal to one frontoparietal, deeply enclosed by the greatly enlarged parietals; two pair of nuchals, anterior pair distinctly larger. Nasal elongate and divided, anterior part larger, nostril mostly posterior of middle; two loreals, anterior half size of posterior, and higher; two presuboculars, upper twice size of lower, two right side and three preoculars left side, first largest; five superciliaries right side and six left side, first, second and last largest in order given; three postsuboculars, upper largest; two postoculars; primary temporal absent; upper secondary greatly enlarged and in broad contact with sixth and seventh supralabials; lower secondary temporal small, higher than long; tertiary temporal equal in size to lower secondary, and separated from ear opening by one scale; seven supralabials, seventh largest; two postlabials between seventh labial and lower secondary temporal and ear opening; three ear lobules, middle one largest. Mental moderate ,extending to middle of first supralabial; postmental large, twice size of mental; three pair of large chinshields followed by an elongate postgenial.

Longitudinal scale rows at middle of body 24; dorsals 57; ventrals 43; lamallar formula of fingers 5 7 9 10 7, of toes 5 8 10 11 9. Ear opening moderate in size, round and approximately 4 mm from posterior corner of eye; anterior corner of eye 3.5 mm from snout; length of eye distinctly less than distance from eye to nostril; adpressed legs separated by three scales; total length 118 mm; snout to vent 54 mm.

Color and Color Pattern.—Dorsum a brownish olive between legs, anterior to shoulder darker, becoming dark brown on head; dorsolateral stripes distinct from frontonasal to base of tail, crossing on each side the supraoculars, and extending onto second, second and third, third, and third and fourth scale rows between nuchals and tail; stripes with dark inner margins from shoulders to head; a dark brown stripe extends from nasal along lateral parts of head and body to tail: between legs it occupies all of fifth and half of each adjoining row; lateral stripe absent; ventral color a uniform bluish-grey be-

tween the seventh scale rows; tail a dark bluish washed with grey; throat and chest lighter.

Range.—Known from the high mountains (9000-8000 ft.) west and south of El Salto, Durango; from La Laguna, Jalisco, and from Mojarachic, Chihuahua, Mexico.

Remarks.—Specimens belonging to the type series are uniform in most characters. All have 24 scale rows, 6-6 infralabials, and lack the post nasal. The dorsals range from 56 to 60 and the ventrals from 40 to 45. In one paratype the supralabials are 8-8, in a second 7-8, all others have a 7-7 formula. The frontonasal is in contact with the frontal in nine of the twelve types, and the superciliaries are 6-6 in all save one specimen with a 5-6 formula.

The color pattern of the type series is uniform, with the dorsolateral stripes distinct to the tail but less obvious on the posterior of the body. In contrast to some species, in which a fading also occurs on the body, *b. bilineatus* has a gradual intensification of the dorsolateral stripe on the thighs and the base of the tail before blending with the general color.

The ovoviviparous type of reproduction is also indicated inasmuch as two fully developed embryos are present in the oviducts of specimen No. KU 044727.

Eumeces brevirostris bilineatus is seemingly closely related to *Eumeces indubitus* and *dugesii*, as well as typical *brevirostris*. In the head scalation *bilineatus* appears to be more nearly like *indubitus* than *brevirostris*. As I have examined the limited material and data available to me and have compared it with the detailed descriptions given by Taylor (1935 University of Kansas, Sci. Bull. 36:457-489, pls 41, 42, 43), I get the feeling that we are dealing here with a wide spread species (*brevirostris*) and a series of four subspecies (*dugesii*, *indubitus*, *bilineatus*) and perhaps others when the data is more complete.

I am indebted to Dr. E. R. Hall and Mr. John M. Leglar for permitting me to examine the type series from the University of Kansas Natural History Museum; to the late Dr. Karl P. Schmidt and Dr. Doris M. Cochran for the privilege of examining certain materials while at the Chicago and U.S. National Museums, and to Dr. Norman Hartweg for a loan of specimens from the Michigan Museum of Zoology.

NOTES ON THE HERPETOLOGY OF BAKER COUNTY, OREGON[1]

Denzel E. Ferguson, K. Ellsworth Payne
and Robert M. Storm

Baker County, located in northeastern Oregon, is separated from Idaho by the Snake River and from Washington by Wallowa County. Its climate is quite diverse due to a wide variation in physiography. Vegetation types vary with altitude and exposure from rather typical sagebrush lowlands to montane and subalpine forests at intermediate elevations, with a few higher peaks extending above timberline. Major streams in the area flow eastward and empty into the Snake River with their main tributaries originating within the Elkhorn and Wallowa Mountain ranges. The county is of particular herpetolgical interest because it apparently represents the periphery of northward distribution for certain Great Basin forms whose ranges extend down the Snake River Valley. For example, see the range maps for *Cnemidophorus tigris tigris* Baird and Girard and *Phrynosoma platyrhinos platyrhinos* Girard in Stebbins (1954). Within the county the Snake River Valley progressively narrows toward the north until it is transformed into Hell's Canyon near the Baker-Wallowa Co. boundary. This entire area is little known, largely because of its inaccessibility. Our collection from this area is inadequate, but seems to indicate that many of those Great Basin species preferring a sandy sagebrush type of environment do not inhabit the canyon, appearing instead to drop out short of it in northern Malheur County.

In the period from April to July, 1954 and again in May of 1955, brief collecting excursions were made into the county. In all, 6 species of amphibians and 9 species of reptiles were obtained, most of which had not previously been recorded. Part of the specimens mentioned in the following annotated list were procured with the aid of Dr. David L. Jameson (University of Oregon) on a trip made June 25-27 1954 We are most grateful for his assistance. We wish, also, to thank Mr. Albert Mozejko (Oregon State College), who has supplied us with several specimens collected by his students while he was on the teaching staff at Baker Jr. High School.

Amphibia

1. *Ambystoma macrodactylum* Baird. A series of 27 long-toed salamanders was collected June 26, 1954 from near a small lake 0.2 mile east of Anthony Lakes (Elev. 7100 ft.). The animals were found under objects on the ground up to 150 feet from the water's edge. A smaller series was taken from loose rocks adjacent to a pool near the entrance to an abandoned mine shaft located in the Snake River Canyon about 10.3 miles north of Home on the Robinette-Huntington road. Adults and larvae were collected from Pine Creek Reservoir on June 6, 1952 and larvae from Cow Creek, near King Mountain, on July 10, 1954. We have several adults from Baker.

1. Contribution from the Department of Zoology, Oregon State College, Corwallis, Oregon.

2. *Bufo boreas boreas* Baird and Girard. On June 20, 1954 near Anthony Lakes, these toads were quite abundant in small ponds derived from melting snow waters. Pairs in amplexus were observed at this time. Eggs were collected June 27, 1954 about 0.2 mile east of Anthony Lakes. The preferred habitat seems to be moist areas having grasses and sedges similar to that found along the margins of ponds, lakes and streams. Localities: 10 mi. N. Home; Main Eagle Creek, T6S. R43E. Sec. 21; Anthony Lakes; 5.5, 2.2 and 0.2 mi. E. Anthony Lakes.

3. *Hyla regilla* Baird and Girard. This little amphibian was common under objects on the ground or in grassy moist situations. Localities: Baker; Cow Creek near King Mt.; Little Eagle Creek, T7S. R44E. Sec. 13; Anthony Lakes; 2.2 mi. E. Anthony Lakes.

4. *Rana catesbeiana* Shaw. A single bullfrog was secured May 27, 1955 from a pond located 1.7 miles northeast of Huntington along the road to Robinette. Others were seen and heard calling at this same pond.

5. *Rana pipiens brachycephala* Cope. Several leopard frogs were captured in the grass along the margin of the same pond mentioned above in the account of *R. catesbeiana*.

6. *Rana pretiosa luteiventris* Thompson. This species frequents permanent ponds and streams. Localities: 8 mi. NW. Durkee on U.S. 30; Anthony Lakes; 4.7 and 7.7 mi. NE. Bridgeport; North Powder; Baker.

Reptilia

7. *Sceloporus graciosus graciosus* Baird and Girard. This small lizard was common at the base of sagebrush plants in areas having sandy soils. Localities: Baker; Huntington; 3.2 mi. NW. Durkee on U.S. 30; 4.7 mi. NW. Pleasant Valley on U.S. 30.

8. *Phrynosoma platyrhinos platyrhinos* Girard. A single specimen was obtained from the sandy south slope of a hill located 0.5 mile east of Huntington. It constitutes the northern-most record of occurrence known for the species in Oregon.

9. *Cnemidophorus tigris tigris* Baird and Girard was collected at several localities (0.8, 1.5, 2.5 and 5.2 mi. N. of mouth of Brunt River) along the Huntington-Robinette road and 0.3 mile northeast of Huntington. The habitat was in sandy areas adjacent to sagebrush and large boulders along the river bank. The species has not been collected north of these collection sites although it has previously been taken nearby (3 mi. NE. Huntington) by Gordon (1939), and Nate Cohen, a graduate student in zoology at Oregon State College, reports having seen it near Robinette.

These specimens have been compared with *C. t. tigris* from several places in Malheur and Harney Counties in Southern Oregon and their pigmentation and color pattern were found to differ quite strikingly in many cases. The population is presently under investigation.

10. *Eumeces skiltonianus skiltonianus* Baird and Girard. Localities: Baker; 12 mi. SE. Baker on U.S. 30; 0.8 mi. N. mouth Burnt River.

11. *Thamnophis elegans vagrans* Baird and Girard. Localities: Baker; 4 mi. E. Haines on U.S. 30.

12. *Thamnophis sirtalis fitchi* Fox. Localities: 4 mi. E. Haines on U.S. 30; 1 mi. E. Anthony Lakes; 3 mi. NW. Lime on U.S. 30; 4.7 mi. NE. Bridgeport.

13. *Coluber constrictor mormon* Baird and Girard. Localities: 5 mi. S. Medical Springs; 5 mi. S. Robinette; 2 mi NE. Huntington; 5.3 mi. N. mouth of Burnt River; 5.2 mi. E. Hereford on Ore. Hiway 7.

14. *Pituophis catenifer deserticola* Stejneger. Localities: 3 mi. S. Bridgeport; 12 mi. SE. Baker on U.S. 30; Cow Creek near King Mt.; DOR 1 mi. N. Home; DOR 17 mi. N. Huntington; 0.5 mi. E. Huntington; 0.4 mi. N. Bridgeport Jnct. on Ore. Hiway 7.

15. *Crotalus viridis* Rafinesque On May 29, 1955 a den of rattlesnakes was discovered in some basaltic cliffs located at a point 1.3 miles southeast of Pleasant Valley. At the time of our visit, the snakes were apparently just emerging from the den as seven were found basking in the sun near large crevices leading back into the cliffs. The four specimens which were captured show the light coloration characteristics of the subspecies *lutosus*, and are probably intergrades between *lutosus* and *oreganus*. Specimens found DOR 17 miles north of Huntington and near Lime on U.S. 30 were more typical of the subspecies *oreganus*.

Scaphiopus hammondi, *Sceloporus occidentalis* and *Charina bottae* were not collected from the county, but locality records are reported by Gordon (1939). Representatives of these species are not available in the Oregon State College Museum of Natural History Collection. The following reptiles and amphibians have been reported from adjacent areas and some of them probably occur in Baker Co.: *Ascaphus truei* (reported from West Eagle Creek in Union Co. by Ferguson (1954), the locality being only 0.5 mile outside Baker Co.). *Chrysemys picta*, *Bufo woodhousei*, *Pseudacris nigrita*, *Crotaphytus collaris*, *Crotaphytus wislizeni*, *Phrynosoma douglassi*, *Uta stansburiana*, *Hypsiglena torquata*, and *Masticophis taeniatus*. It will be noted that the list consists largely of members of the Great Basin herpetofauna to which the Blue Mountains may act as a distributional barrier.

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NOTES ON *CONIANA SNOWI*, AN ACRIDID NEW TO THE UTAH LIST

Ernest R. Tinkham[1]

During the course of investigations on the "Environmental Relationships of Desert Sand Dune Biota", under a three-year summer grant with the National Science Foundation, the writer has recently studied, during the summer of 1958, many of the sand dune areas in western, southeastern and southwestern Utah.

The sand dune areas of extreme southwestern Utah, particularly, appear to be the only ones pertaining to the Great Sonoran Desert and, consequently, their faunal and floral affinities are with those of southern Nevada and southeastern California. On these dunes certain insects can be found that are restricted to southwestern Utah and some of these may be new to the Utah List. Such a one is *Coniana snowi* Caudell, one of the sand dune oedipodine Acridids. Its presence in Utah was first evident in early June of 1958, when a few small nymphs were found but these could not be reared through to maturity because of lack of the host plant. The first of these nymphs was found on June 12, three miles northwest of Santa Clara on a small sandy hill. The next day, on the brick red sands of what is here called the Hurricane Dunes that lie five miles west and five miles south by road of Hurricane, Utah, a few more were taken.

On August 6, during a research excursion through the Navajoland of northern Arizona and southeastern Utah, the writer took occasion to study the Hurricane Dunes again. The first rain in several months fell in the late evening wetting the sand to a depth of three inches. A good hike about sundown failed to reveal any *Coniana* in areas where nymphs had been found in June, although one female adult was taken elsewhere, just before dark, in the semistabilized sand areas that were dominated by large clumps of the beautiful bluish gray sage, *Artemesia filifolia* Torrey. No *Coniana* were found on the dunes that night during several hours of collecting by lantern light.

Next morning three or four males and females were taken during three hours of collecting between 8:30 and 11:30 a.m. The temperature at 8:30 was 76° F. but the considerable humidity after the rain made air conditions seem much hotter. At 10:45 with a slight cloudy overcast the air temperature was 86° but with the high humidity the air was very hot. At this time several *Coniana* were found on a low sandy ridge near the mouth of a sandy draw and were scared out of the protection afforded by the scant shade of al eguminous plant about one foot high known as *Euphorbia parryi* Engelm. The sand temperature under the plants was 98° F and *Coniana* found this microhabitat preferable to the open sand where the surface temperature was 104°. When the sun came out momentarily it seemed burning hot almost instantly and had such conditions existed for any length of time the sand surface temperature would have

1. Indio, California

been much greater. As it was these sand temperatures were not as great as those tolerated by *Coniana snowi* on the Kelso Dunes or on the sand dunes of Coachella Valley of the Colorado Desert where they will squat some minutes on the sand with temperatures in excess of 118°.

In Coachella Valley and the Kelso Dunes *Coniana* prefers habitats of the low caespitose sand plant *Coldenia plicata* and when the sand temperatures become intolerable they climb or jump up on these low plants where the temperature one inch above the sand surface can be tolerated. On the Hurricant Dunes a few plants of *Coldenia canescens*, a plant common over much of the Great Chihuahan Desert is found, but apparently their spiny nature renders them unattractive to *Coniana*.

Later, that afternoon, the writer stopped at the small sandy hill, three miles northwest of Santa Clara, and collected a few more adults of *Coniana*. The area from one to three miles northwest is generally sandy and throughout this area *Coniana* should be found. In both sand dune areas *Coniana* was rare.

The author did not find *Coniana* at the Coral Pink Dunes which lie 13 miles southeast of Mt. Carmel Junction and about 15 miles northwest of Kanab. Although in southwestern Utah, these dunes lie at a high elevation of over 6000 feet and within the Pine Zone and hence are quite different floristically and faunistically. Their faunal and floral affinities seem to be more with those of southeastern Utah of what can be called the Desert of San Raphael, rather than with those of the Great Sonoran Desert.

These are the first records of this small ammophilous Acridid for Utah and *Coniana snowi* Caudell can now be added to the Utah list.

Hydrometra Martini found in Central Utah

On 24 June, 1958 a specimen of *Hydrometra martini* Kirk was collected by the writer two miles east of Goshen, Utah. From all indications this is a new record for this family and species in the State of Utah. The specimen was taken among cat-tails, sedges and algae around the edges of a pond. The pond, one of several in the area is fed by hot springs. The temperature of the water in the ponds is 22.2° Centigrade. During the next three days the writer in company with Dr. Stephen L. Wood and Lee F. Braithwaite collected over 75 specimens including males, females and nymphs. Several mating pairs were placed in an aquarium for observation. One mating pair was placed alone and it was found that the female produced thirteen eggs. This determination is based on the key and other information on Hydrometridae found in Hungerford's article on "The Biology and Ecology of Aquatic and Semiaquatic Hemiptera", The Kansas Science Bull., Vol. XI, p. 91-99, 1919—Stanley K. Taylor.

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NEW AND INSUFFICIENTLY KNOWN *EXOPROSOPA* FROM THE FAR WEST (*DIPTERA*: *BOMBYLIIDAE*)[1]

D. Elmer[2] and Lucile M. Johnson

In the course of identifying the bee-flies collected in the southern extension of the Great Salt Lake Desert, a number of apparently undescribed species have been discovered. Three of these species belong to the genus *Exoprosopa* Macquart. Two other species in this genus in our collection, one each from Arizona and California, are also apparently undescribed. Another species, *Exoprosopa doris* Osten Sacken, inhabiting at least part of the ranges of three of the species described herein, is not sufficiently well described in literature to be positively identifiable. A redescription of *E. doris* O. S. and descriptions of the new species are given below. The types of the new species are, for the time being, retained in our collection.

We wish to acknowledge the courtesy of Dr. Philip J. Darlington, Jr., Museum of Comparative Zoology, for comparing our specimens with the type of *Exoprosopa doris* Osten Sacken.

Exoprosopa doris Osten Sacken

Figs. 3, 10, 18, 19, 25

Osten Sacken's description of this species overlooks several important definitive characters. In fact, his description fits so much better one of the species described below as new, that we were satisfied with our determinations only after Dr. Darlington had compared specimens of both species directly with Osten Sacken's type. Dr. Darlington informs us that the type is much smaller than the specimen sent him for comparison, being only five millimeters in length. Since our series contains specimens from seven to sixteen millimeters long, size is not considered to be an important factor.

A redescription of this species follows:

Male.—Oral margin, face and lower half of front red, rest of head black. Vertex brown pollinose, occiput gray pollinose. Pile of front short, sparse, suberect, black, that of face appressed, black in the middle, nearly white on cheeks. Tomentum of front and middle of face subshinging tan, of cheeks nearly white, that of occiput shining white. First antennal segment red, three times as long as broad; second segment red below, dark above, not quite as long as broad;

1. This work was supported in part by the U.S. Army Chemical Corps Contract No. DA-18-064-CML-2639, with the University of Utah.

2. Associate Entomologist, Ecological Research, University of Utah, Dugway, Utah.

third segment black, long-conical, its style about one-half as long as the basal portion. Pile of antennae black, two or three golden hairs on the outside of the first segment.

Thorax mostly black, brown pollinose on the dorsum, thinly cinereous on the pleura. Pile of collar pale yellowish; of mesonotum short, sparse, black; of pleura pale yellowish above, white below. Tomentum of mesonotum brown, paler on the anterior portion and on three very indistinct vittae; white above each wing and adjacent to the scutellum. Tomentum of pleura white, that on sterno- and hypopleura appressed and shining. Scutellum red, narrowly black basally, pile black, marginal bristles black, submarginals yellow; tomentum golden brown, paler apically, narrowly white basally.

Wings hyaline, base, costal margin and first basal cell brown; clouds of brown in the marginal, first marginal, and first posterior cells form an indistinct, interrupted fascia; a proximal fascia is formed by brown in the discal cell through the anal cell, invading the distal end of the second basal and proximal ends of the third and fourth posterior cells. There are clouds at the base of the discal, on the anterior cross-vein, on the base of the second vein, and near the base of the vein separating the second and third posterior cells. Tomentum at base of costa brown, narrowly white posteriorly along the vein, pile black.

Coxae brown, trochanters black, femora and tibiae red, tarsi red basally, darkening distally until the last three segments are black. Pile of coxae pale yellow and white, of femora black on anterior half and nearly white posteriorly. Tomentum of coxae shining white, of rest of legs pale yellowish, black on forward side of tibiae and on forward distal part of femora. Bristles of legs black. Stems of halteres pale brown, their knobs nearly white.

First abdominal segment and medial third of second to fifth tergites black, a black triangle basally on sixth. Rest of abdomen red. Pile of first and on sides of anterior three-fourths of second segments abundant, pale yellow, on sides of rest of segments mixed black and pale yellow, the black concentrated on the hind angles of the segments. A little very sparse, short black pile on dorsum, mostly near hind margins of segments. A row of coarse, mostly black pile across hind margins of sixth and seventh segments. There is a fringe of ocheraceous scales along hind margin of first segment. Tomentum of anterior half of second white, posterior half ocheraceous, a broad fascia of black scales, interrupted in the middle, between the ocheraceous and white scales, a black fringe on hind margin. A fascia of mostly black scales across the anterior half of third tergite which does not reach the lateral margins, behind this is ocheraceous tomentum; a fringe of black scales across hind margin is quite broad medially; a few white scales are on the sides of the segment. Tomentum of fourth tergite mostly white, narrowly black basally and apically, a median patch of mixed black and ocheraceous; rest of tomentum ocheraceous. Tomentum of sixth and seventh tergites shining white.

Venter red, pile nearly white, tomentum of first four sternites shining white, of rest of venter pale yellowish, a few black scales on fourth and fifth sternites. Genitalia red, pile pale yellow.

Female.—Much like the male. A few more black scales on the legs. The tomentum of sixth tergite is pale tan with a fringe of slightly darker scales on the hind margin.

These descriptions were prepared from specimens collected in Tooele County, Utah. We have examined specimens from Arizona, California, Idaho, Nevada, Texas and Utah. The specimens we have personally collected have been found mostly in desert conditions, usually on the valley floors rather than in the mountains.

In addition to the considerable difference in size there are some differences in color of vestiture. The specimens from California have fewer black hairs on the face, and some specimens lack them almost altogether, have fewer or no black hairs on the hind margins of the sixth and seventh terga, and have less black tomentum on the abdominal dorsum than specimens from Utah and Idaho. Within the series studied the amount of brown in the wing varies from two practically unbroken fasciae to hardly more than faint, interrupted shadows at these points. There is considerable variation in the number of black scales on the abdominal venter. Some specimens have black scales on all sternites, while some have only a very few on the fifth. There is more or less variation in the relative length of the antennal style. In some specimens the second antennal segment is wholly black, while in others it is wholly red. One specimen from Utah has the first posterior cell closed in one wing and open in the other, while one California specimen has this cell closed in both wings and very short petiolate. Despite these differences we consider these specimens to be all the same species.

Exoprosopa hyalipennis Cole is like this species, the principal difference being in the color of the wings. Our series of *doris*, in which is to be found every intergrade between a very heavily infuscated wing and an almost completely hyaline one would indicate that this character alone might be unreliable as a means of identification of some single specimens.

Exoprosopa arenicola, n. sp.

Figs. 5, 11, 23, 24, 27

Related to *doris*, but has fascia of white scales on anterior mesonotum and lacks fasciae of black scales in centers of second and third tergites. Length 5½-14 mm.

Male.—Face, cheeks and most of front red, extreme upper front and occiput black, vertex thinly brown pollinose, occiput thinly cinerous. Tomentum of face and front sub-shining brownish yellow, somewhat darker on upper front, and paler on central part of face. Tomentum of occiput white, yellowish at vertex. Pile of head yellow, two or three dark hairs on each orbit near vertex and a few short black hairs on ocellar tubercle. First antennal segment red, about

twice as long as wide, a few black hairs on upper side distally, rest of pile golden. Second segment brown, only about half as long as wide, nearly as wide as first segment, short black pile on upper side, golden beneath. Third segment black, long conical, about three times as long as wide, its style little if any longer than the width of the segment at its widest. Proboscis short, only the tips of the labellae projecting beyond the epistoma.

Thorax mostly dark brown, pile pale yellowish, nearly white below the wings. A fascia of white tomentum across anterior third of mesonotum extends backward at each side above the wings to scutellum, a second very narrow fascia lies immediately before the scutellum; rest of mesonotal tomentum golden brown; tuft of long snowy hair-like tomentum on mesopleura below wing; a small patch on hypopleura and most of sternopleura covered by appressed snow-white tomentum. Notopleural bristles black, postalars red. Scutellum red, narrowly black basally, its tomentum white basally and very narrowly apically, otherwise golden brown.

Scutellar bristles mixed black and reddish yellow, mostly the latter. Coxae brown, golden pilose and tomentose, rest of legs evidently red in ground color, densely tomentose. Tomentum of tibiae mostly black, golden brown externo-proximally. All vestiture of tarsi black, the last three segments evidently black in ground color. Sparse short pile of femora and all bristles of legs black.

Wings hyaline, bi-fasciate with brown. The distal fascia extends from near end of auxiliary vein across the marginal, first sub-marginal, and first posterior cells, and across distal end of discal and proximal end of second posterior cells, and narrowly invades third posterior cell. Proximal fascia begins at bifurcation of second and third veins and crosses wing into axillary cell, invading bases of discal and first, third and fourth posterior cells, and distal ends of both basal cells, crosses anal cell in its distal third, but does not reach hind margin of wing. Base of wing and costal margin also yellowish brown. Veins brown. Tomentum at base of costa yellow, white at extreme base and narrowly along vein posteriorly, pile black. Halteres pale brownish, knobs pale yellow.

Abdomen mostly red, first segment and triangles on second and third black. Pile on lateral margins mostly yellow, paler on first and second segments, a few black hairs on hind angles of third and fourth, and many black hairs on lateral margins of fifth segments. First segment with fringe of tan scales along hind margin. Hind margins of second to fifth tergites narrowly black tomentose, the black scales not reaching the lateral margins on any segment, confined to a narrow spot in the middle of the fourth. Anterior half of second, most of fourth and all of seventh segment white tomentose. Fourth tergite, caudal half of second, most of third and fifth, and very narrowly basally and apically on sixth tannish tomentose. The tan tomentum on third tergite is paler basally, being nearly white on the sides on the anterior half. The very short sparse pile of the abdominal

dorsum is black on second to fifth tergites. Venter red, pile nearly white. Tomentum of first four sternites moderately dense, snow-white; of fifth to seventh pale yellow, a few dark scales at the base of fifth. Genitalia yellowish red, hairs yellow.

Female.—Very much like the male. Tomentum of face much paler, being nearly white on lower front and center of face. The wings are somewhat less infuscated, particularly in the area of the distal fascia. Somewhat more black pile on the first antennal segment. Second antennal segment, as well as first, red. There is much more black in the ground color of the abdominal dorsum, this color being present on all segments, fourth, fifth and sixth tergites being largely dark. Tomentum at the base of third and most of that on fourth tergites white, or nearly so. Fifth and sixth sternites black medially. Genitalia brown, hairs and bristles yellowish brown.

Types.—Male *holotype* and female *allotype*: West side Little Granite Moutain, Tooele County, Utah, July 27, 1955 (D. E. Johnson). *Paratypes*: 54♂ 60♀ Little Granite Mountain, VII-19 - IX-15; 3♂ 2♀ southwest end Cedar Mts., VII-20 - VIII-4; 4♂ 12♀ southeast end Cedar Mts., VII-20 - VIII-21; 4♂ 18 miles southwest Orr's ranch, VII-9 - VIII-11. All locatities in Tooele County, Utah, all specimens collected by D. E. Johnson. Part of the paratypes are in the collection of the University of Utah.

This species varies quite remarkably in size. The smallest specimen in our collection is a male 5.5 millimeters in length, the largest a female that is 14 millimeters. The smallest female is 6 millimeters, the largest male 12 millimeters. The females average appreciably larger than the males, the thirty-one females measured averaging 10.1 millimeters in length, while the ninteen males averaged only 8.3. There is considerable variation in the extent of infuscation in the wings. The darkest specimen is a male in which both wing fasciae are uninterrupted. The specimen having the palest wings is a female in which the distal fascia is reduced to a faint shadow in the middle of the posterior cell and the proximal fascia is reduced to spots on the anterior and posterior cross-veins and at the bases of the discal and third posterior cells, and faint clouds in the distal third of the anal and proximal third of the discal cells. In many specimens of both sexes the second antennal segment is black, in some it is red. In most males it is brown and in most females it is red as in the types. In one small male and one small female the tomentum of the seventh tergite is yellow.

All specimens seen were encountered in sandy areas, hence the name. Most of the ones collected were taken in vegetated dunes, where the dominant vegetative types are *Eriogonum* and *Chrysothamnus*. Most of the specimens were captured on the ground. A few were observed to be feeding at blossoms of *Eriogonum dubium* Stark, the only plant blooming in the area at the time. The species was not common until about the middle of August, after which time it was

fairly abundant. By the time the last specimens were collected, in the middle of September, the species was again becoming scarce, as were all bee-flies in the area.

Exporosopa butleri, n. sp.
Figs. 1, 12, 13, 14, 28

Related to *E. iota* O.S., but with a fascia of white scales across anterior mesonotum and with red face and legs. Tomentum of sixth abdominal segment tan. First posterior cell closed and long-petiolate. Length 9-17 mm.

Male.—Face and lower third of front red, cheeks yellow, rest of head black. Pile of front black, that of face pale yellow, tuft of black pile on anterior angle of epistoma. Tomentum of face and front sub-shining pale tan, nearly white on cheeks, sparse on upper two-thirds of front. Tomentum of occiput shining white, becoming yellowish toward vertex. First antennal segment about twice as long as wide, a little more than twice as long as the second segment; third segment long-conical at base, without its style about as long as first two combined. Style not quite as long as first segment, very slightly longer than the width of the third segment. First two segments red, with black pile; third segments black. Tips of labellae barely project beyond the epistoma. Palpi one-fourth the length of the proboscis, brown with pale hairs.

Thorax mostly black, pleura with some red. Mesonotum thinly brown pollinose, pleura thinly cinereous pollinose. Pile of collar pale yellow, that of rest of mesonotum very short, black. A fascia of white tomentum across anterior third of mesonotum, extending backward above the wings to posterior angles of thorax. A narrow band of white scales just before the scutellum, rest of tomentum of mesonotum pale golden brown, somewhat lighter at sides. A tuft of white hair-like tomentum below wing on posterior angle of mesopleura, immediately before and behind which are tufts of pale yellow hair. Patches of appressed, snow white, shining tomentum on sterno- and hypopleura. Scutellum red, narrowly black basally, tomentum sub-shining pale tan, sparse pile black, large marginal bristles black; a row of finer, shorter bristles below (posterior to) these are yellowish.

Legs red, coxae brown. Tomentum of fore coxae pale yellow, of middle and hind coxae white; pile of middle and fore coxae mixed with black, red and yellow, of hind ones nearly white. Tomentum of legs mostly yellow, that on fore part of tips of femora and front of tibiae black. Pile sparse, short and fine, that on forward half of femora black, on posterior half pale, bristles black.

Wings gray hyaline, brown at base and anterior to fourth vein, with two darker transverse fasciae. The distal fascia begins at about the end of the auxiliary vein and extends obliquely through the first posterior, very narrowly invading the tip of the discal and anterior angle of the second posterior cells. The proximal fascia begins in the marginal cell opposite the anterior cross-vein and extends in an ir-

regular, diagonal, inverted arc to the distal third of the axillary cell, invading the bases of first submarginal and first, third and fourth posterior cells, the distal ends of both basal cells, and crossing the proximal third of the discal and distal third of the anal cells, but not reaching the margin of the wing. There is a spot of brown on the base of the vein separating the second and third posterior cells. About the distal fifth of the marginal, first submarginal and first posterior cells are hyaline. The first posterior cell is closed and long-petiolate, the fourth vein joining the third at a point about three-fifths the distance between the branching of the latter vein and the wing margin. Tomentum at base of costa tan with a few white scales along the base of the vein posteriorly, pile black. Stems of halteres brown, knobs nearly white.

Abdomen red, first segment and broad triangle on central base of second segment, and smaller similar triangle on third black. Nearly white pile on sides of segments, abundant on first and anterior half of second segments, sparse on fore angles of following segments. Black pile on hind angles of second and following segments except seventh. Very sparse short black pile near hind margins of second to sixth tergites. Tomentum of hind margin of first segment mixed with tan and black, basal half of second white, caudal half rufus, with fringe of black scales on hind margin and an interrupted fascia of black between white and rufus scales; third segment rufus, nearly white laterally and with a broad, interrupted fascia of black, a very narrow fringe of black scales on hind margin; fourth segment nearly all white, narrowly mixed with tan and black basally and on hind margin; fifth and sixth segments tan, the fifth with narrow interrupted fascia basally and narrow fringe on hind margin of black scales; tomentum of seventh segment white, faintly yellowish centrally. Abdominal venter yellow, pile and tomentum nearly pure white; genitalia yellow.

Female.—In general appearance much like the male. Pile of face black except at the sides. Abdomen broadly black on all segments. Pile of seventh tergite and genitalia mostly black. Many more black scales on abdomen. Tomentum at base of wings brownish.

Types.—Male *holotype*, four mi. E. Apache Junction, Arizona, May 15, 1954 (George D. Butler, Jr.). Female *allotype*, Sycamore Canyon, Atascosa Mts., Arizona, May 22, 1955 (George D. Butler, Jr.), on *Senecio longilobus*. *Paratypes*: 1 ♀ Atascosa Mts., V-22-54 (Butler); 1 ♂ Sycamore Canyon, Atascosa Mts., V-24-1954 (Butler); 1 ♀ Catalina Mts., 2 mi. HkHy, V-8-1954 (Butler); 1 ♀ Catalina Mts., 5 mi. HkHy, VIII-22-1954 (Butler); 1 ♀ Claypool, VIII-27-1956 (Butler and Gerhardt); 1 ♂ Elfrida, VII-27-1954 (Butler); 1 ♂ Mesa, IV-10-1952 (D. E. Johnson); 1 ♀ 6 mi. S. Mountain View, V-5-1954 (Butler); 1 ♂ 1 ♀ Sacaton, VI-4-1956 (A. D. Telford); 1 ♂ Sahuarita, IV-19-1956 (Butler); 1 ♂ Seneca, Salt River Bridge, VII-15-1956 (Butler); 1 ♀ Sunnyslope, V-26-1954 (Butler); 1 ♂ 2 mi. E. Texas Canyon, Cochise County, V-11-1956 (A. D. Telford); 1 ♂ Tombstone,

V-2-1956 (Butler and Werner); 1♂ Thompson Arboretum, Superior, VII-23-1956 (Butler and Gerhardt); 1♀ same locality, V-15-1954 (Butler); 1♂ 3♀ Tucson, III-15 - V-7-1956 (Hastain, Shelly, Stewart); 1♀ 10 mi. N. Tucson, IV-24-1955 (Butler). All of the above localities are in Arizona. Part of the paratypes are in the collection of the University of Arizona.

In addition to the differences in size there is more or less variation in the extent of the brown in the wing in this species. In some specimens the proximal fascia is interrupted in the discal cell. In others the distal fascia joins the brown spot at the base of the third posterior cell. In some specimens the juncture of the fourth and third veins is nearer the branch of the latter than in the holotype. The holotype has an adventitious cross-vein that is not present in any of the other specimens at hand. In most specimens the small cross-vein is exactly opposite the base of the second vein. There is some variation in the amount of black tomentum on the abdomen.

This species appears to be most closely related to *iota* O.S. It differs from the description of that species in having the face, most of the abdomen and the legs red rather than black as in *iota*, and in having silvery scales on the seventh tergite only. In his description of *iota* Osten Sacken makes no mention of white scales anteriorly on the mesonotum, such as are present in *butleri*. *Butleri* may be separated from *doris* by the wing venation, by the presence of silvery white tomentum on the seventh tergite only, of the males, by the lack of black tomentum on the abdominal venter, and by the fascia of white scales across the anterior mesonotum. It may be separated from *arenicola* by the wing venation, by the larger average size, and by the fasciae of black scales on the abdominal dorsum.

The single specimen collected by the senior writer was captured in a dry, sandy stream bed, along with a number of other species of bee-flies.

It gives us pleasure to name this species in honor of Dr. George D. Butler, Jr., Department of Entomology, University of Arizona, who has collected many fine bee-flies in southern Arizona.

Exoprosopa cingulata, n. sp.

Figs. 7, 8, 17, 22

Wings bifasciate with brown, abdomen white tomentose with a cross-band of tan scales, legs entirely red. Length 12-14 mm.

Male.—Lower third of occiput, face, and all but extreme upper front red, upper front and upper two-thirds of occiput dark brown, thinly brown pollinose. Tomentum of face, front and vertex brownish yellow, nearly white on sides of face, subshining on face and lower two-thirds of front. Tomentum of occiput nearly white, appressed and shining on post-orbits. Pile of upper third of front black, of rest of head yellow. Barely the tips of the labellae projecting beyond the epistoma. Proboscis dark brown, palpi red, pile brownish yellow. First two antennal segments red, third brown, paler apically; first segment

nearly twice as long as wide, second about three-fourths as long as wide, not quite as wide as first segment. Third segment long conical, without its style about as long as the first two combined, style very slightly longer than width of the third segment at its widest part. Antennal pile nearly all yellow, a few black hairs on upper side.

Thorax brown, pleura with considerable red. Mesonotum thinly brownish pollinose. Pile of thorax mostly pale yellow, a very few short black hairs on the mesonotum near the suture. Tomentum of mesonotum golden brown, white above the wings and on the pleura, the small patch on the sterno- and a large patch on mesopleura appressed, shining. Notopleural bristles black, rest of bristles of thorax reddish yellow. Scutellum red, narrowly black basally, its tomentum golden brown except basally where it is white, bristles reddish yellow.

Wings hyaline, bifasciate with brown. Distal fascia begins near end of auxiliary vein and extends backward more or less brokenly to base of second posterior cell. Proximal fascia begins at the bifurcation of second and third veins and ends half way across the axillary cell. Base of the wing, costal and subcostal, most of the first basal, and proximal half of first posterior cells also brown. Veins brown, somewhat darker distally. Tomentum at base of costa mostly white, pile black. First posterior cell closed in wing margin. Halteres brownish, knobs nearly white.

Legs red, only the last two or three segments of the tarsi black. Pile and tomentum of coxae nearly white, of rest of legs reddish yellow, a few dark brown scales externo-distally on the femora. Bristles black.

Abdomen red, base of first and triangles on second and third segments black. Except for a few short black hairs on hind margins of second to fifth tergites, pile of abdomen pale yellow. Tomentum nearly all white, that on sixth and seventh tergites shining. Fringe of black scales on hind margins of second and third tergites, a very few on fourth. Caudal third of second, most of third, and a very narrow row basally on fourth with tan tomentum. Venter red, pile nearly white, tomentum of first four segments white, of rest of venter pale yellow. Genitalia yellowish red, hair pale yellow.

Female.—Much like the male. Brown of front somewhat more extensive than in male. Pleura red. Triangle of black ground color in the fourth tergite, as well as in second and third. White of abdomen tinged with yellowish, that of last two segments distinctly so. Only a few darker scales near the tips of middle and hind femora. The first posterior cell is narrowly open at the wing margin.

Types.—Male *holotype* and female *allotype*, Weldon, Kern County, California, August 5, 1945 (D. E. Johnson). *Paratypes*: 1 ♂ same data; 1 ♂ Onyx, Cal., August 23, 1940 (L.J. Lipovsky); 1 ♂ Rosemond, California, July 23, 1940 (R. H. Beamer).

In the left wing of one paratype male the first posterior cell is not quite closed, but in the others is like the type.

This species may be most easily separated from *doris* by the lack of black scales on the abdominal venter, by the lack of fasciae of black scales on the centers of second and third tergites, and by the presence of nearly all white tomentum on fourth and fifth. This species lacks the fascia of white scales on the anterior mesonotum that is possessed by *arenicola* and *butleri*, as well as having the differently colored abdominal dorsum. The effect of the general appearance of this species is that of having a white abdomen across which is a dark-bordered tan band, from which the name derives.

This species was taken, along with a number of other species of bee-flies, on a sandy knoll at the roadside just beyond the small village of Weldon, on California State Highway Route 178. These specimens were captured just before sundown of a hot dry day. They were alternately flitting about and resting on the ground, usually returning to the same spot to rest after being disturbed.

Exoprosopa sharonae, n. sp.

Figs. 2, 6, 15, 16, 26

Related to *titubans* O. S., but the antennal style is shorter and the abdominal tomentum is mostly dark. Length 16-21 mm.

Male.—Cheeks and oral margins yellow; face and most of front black, a red patch across the front one-third the distance between the ocellar tubercle and the antennae, extending down the orbits, and joining the yellow of the cheeks. Rest of head black. Pile of front and vertex black, that of face black in dark areas and yellow where the ground color is light; there is a tuft of short black hair on the anterior oral margin. Tomentum of front and face subshining, brownish yellow. Postoccular tomentum shining yellowish silver; occipital pile short, very pale yellow in color. Upper occiput purplish, upper front brownish pollinose. First and second antennal segments red beneath and black above, pile mostly black, a few pale hairs beneath on the first segment. First segment twice as long as second; third elongate-conical and with style twice as long as the first two combined; style short, scarcely longer than width of third segment. Proboscis short, the labellae scarcely projecting beyond the epistoma. Palpi dark brown, pile black.

Thorax black, faintly brownish gray pollinose, postalar callosities and parts of pleura reddish. Tomentum of mesonotal disc mostly black, three more or less indistinct vittae of pale grayish yellow tomentum on anterior half, broadening and fusing behind to form a patch nearly as wide as the scutellum. Pile of disc short, sparse and black, with a few pale hairs immediately before the scutellum. Pile of collar, pleura, and above wings pale buff, bristles black. Scutellum red, narrowly black at base, most of tomentum black, with buff on margins and behind; bristles and pile black except a few pale hairs on sides.

Legs black; pile of coxae mixed black and yellow, tomentum pale

yellow. Rest of vestiture of legs black except for a few light colored scales on under side of femora.

Wings cinereous hyaline, brown basally and from immediately behind the fourth vein forward, which color is somewhat evanescent distally, extending from the distal fifth of the discal cell to the end of first vein. Darker clouds surround the small cross-vein and base of second vein, base of vein separating discal and second basal cells, and bases of third and fourth posterior cells; a faint cloud is present at base of second posterior. The fifth vein is narrowly bordered with brown to near its tip. This leaves the discal and second basal cells narrowly bordered with brown. Veins brown, darker distally, setulae black. Squamae pale brown with brownish yellow fringe. Stalk of halteres brown, dark yellowish knob.

Center of abdominal segments two to five black, their sides broadly red. Segments six and seven entirely red. Tomentum mostly black, basal half of second, anterior corners of third, most of fourth and sixth, and all of seventh white. Fourth segment narrowly black tomentose in center and with a black apical fringe. There are a few pale scales on sides of fifth segment and a narrow band of yellow scales basally across third. Pile short, sparse, and pale yellow from fourth egment forward on dorsum; long, dense, and nearly white on sides of first and second, shorter on sides of remaining segments, white on anterior corners of third and fourth, black on hind corners of second, third and fourth, and on sides and hind margins of fifth and sixth; pile of seventh segment pale yellow. Venter red; pile and tomentum nearly white except for a few black scales on fifth segment.

Female.—Like the male except fewer black scales on the dorsum of the mesonotum; very narrow transverse band, interrupted in the middle, of pale scales traverse center of third segment; hind margin of seventh segment and genitalia with black pile.

Types.—Male *holotype*, west side of Little Granite Mountain, Tooele County, Utah, September 3, 1955 (D. E. Johnson). Female *allotype*, southeast end of Cedar Mountains, Tooele County, Utah, September 3, 1955 (Sharon Johnson). *Paratypes*: Millard County: 1♂ 1♀ Delta, VIII-19-1957 (D. E. and L. M. Johnson); 1♂ 1♀ Topaz (17 mi. N.W. of Delta), VIII-27-1943 (D. E. Johnson). Tooele County: 27♂ 11♂ same locality as holotype, VIII-12 - IX-14 (D. E. Johnson); 2♂ same locality as allotype, IX-4-15 (D. E. Johnson); 1♂ Simpson Springs, VIII-17-1953 (R. B. Holliman). Part of the paratypes are in the collection of the University of Utah.

This species varies to some extent in size, in the amount of red on the front, and in the amount of light colored pile on the third abdominal segment. In this respect some of the males exhibit the same narrow interrupted band of light colored tomentum as on the allotype female, others have only a few scattered yellow scales. On a few of the male specimens the light colored scales of the second segment are tinged with yellow immediately adjacent to the black

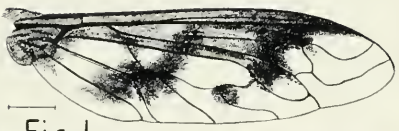
Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12

scales. The length of the antennal style varies from about the same as the width of the third segment to about one and one-half times that length.

This species is closely related to *E. sordida* Loew. but has a shorter antennal style, shorter proboscis, and darker wings. The face of *sordida* is mostly red, with only a small area of black in the middle. The face of *sharonae* is almost wholly black. The pale scales of *sordida* are pale brown or grayish yellow, while those of *sharonae* are white or nearly so. *Sordida* has a generally brownish appearance; *sharonae* appears to be distinctly black and white.

The holotype and most of the paratype specimens were collected on the west side of Little Granite Mountain, Tooele County, Utah. The lower slopes of this so-called "mountain" are occupied in part by a horizontal band of Utah Juniper, *Juniperus osteosperma.* In the upper edge and immediately above the junipers is a narrow area of partially vegetated sand dunes. Above the dunes the vegetation is composed chiefly of shadscale. The dune area between the junipers and the shadscale appears to be the preferred habitat of *sharonae.* Nearly all of the specimens were collected as they fed at the flowers of *Eriogonum dubium* Stark, which holds a prominent place in the vegetation of the dunes.

During the latter part of August and early September these large flies were quite common in this area. They were mistaken for *Exoprosopa titubans* O.S., and since space is an important factor in our collection only a few specimens were collected. By the time it was discovered that the species was apparently undescribed it had become quite rare, and it was with difficulty that one badly worn male was obtained for dissection.

The figures of the wing and antenna are taken from the holotype. The types are in our collection. Part of the paratypes are in the collection of the University of Utah.

This species is named for our twelve year old daughter, who, without benefit of a net, collected the allotype female in near perfect condition.

Exoprosopa utahensis, n. sp.

Figs. 4, 9, 20, 21

Slender, black species, wings smoky, antennal style short. Length 14-17 mm.

PLATE I

Fig. 1, *Exoprosopa butleri*, n. sp., wing of holotype. Fig. 2, *Exoprosopa sharonae*, n. sp. wing of holotype. Fig. 3, *Exoprosopa doris* O.S., Utah specimen. Fig. 4, *Exoprosopa utahensis*, n. sp., wing of holotype. Fig. 5, *Exoprosopa arenicola*, n. sp., wing of holotype. Fig. 6, *Exoprosopa sharonae*, n. sp., abdomen of holotype. Fig. 7, *Exoprosopa cingulata*, n. sp., wing of holotype. Fig. 8, *Exoprosopa cingulata*, n. sp., abdomen of holotype. Fig. 9, *Exoprosopa utahensis*, n. sp., abdomen of holotype. Fig. 10, *Exoprosopa doris* O.S., Utah specimen, male. Fig. 11, *Exoprosopa arenicola*, n. sp., abdomen of holotype. Fig. 12. *Exoprosopa buteleri*, n. sp., abdomen of holotype.

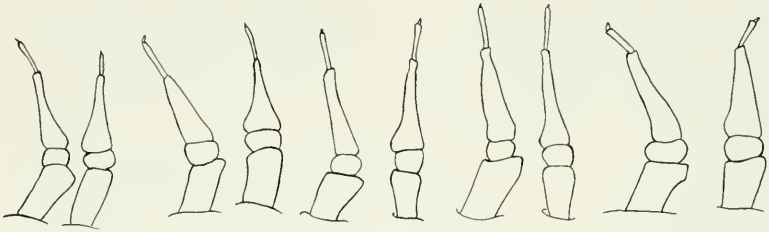

Fig. 13 Fig. 14 Fig. 15 Fig. 16 Fig. 17

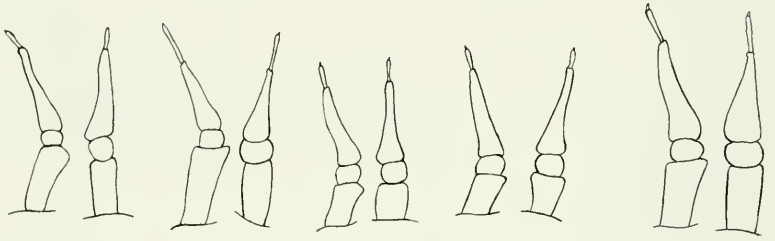

Fig. 18 Fig. 19 Fig. 20 Fig. 21 Fig. 22

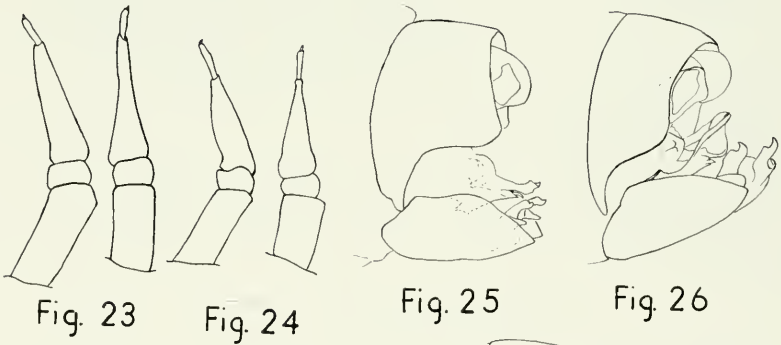

Fig. 23 Fig. 24 Fig. 25 Fig. 26

Fig. 27 Fig. 28

Male.—Head black, cheeks and oral margins yellow. Front and face brownish pollinose, occiput cinereous pollinose. Pile of front and center of face short, sparse and black, that of front suberect. Pile of sides of face and occiput nearly white, a patch of black hairs on the anterior oral margin. Tomentum of front and face pale golden brown, of post orbits shining, nearly white. Antennae black, the second segment reddish beneath; pile black. First segment twice as long as wide, second about four-fifths as wide as first, third only about one and one-third times as long as first two combined; style about as long as width of base of segment at its widest part. Proboscis projects about the length of the labellae beyond the epistoma.

Thorax black, fore part of the mesonotum and pleura cinereous pollinose. Pile of pleura very pale yellow, upper part on anterior half with a reddish tinge, whitish above the wings. Tomentum of mesonotum black, with three vittae of yellowish scales, joining on the posterior part; bristles black, pile just before the scutellum mixed black and yellow. Scutellum red, black basally, pile and bristles black, tomentum mixed black and yellow, mostly yellow on the sides and hind margin, mostly black medially and anteriorly.

Wings dusky, dark before the fourth vein. All veins bordered with brown except distally. Veins brown at base, nearly black distally. Pile and tomentum at base of costa black. Halteres brown.

Legs evidently dark reddish brown in ground color, densely covered with mostly black scales. Coxae with subshining yellow tomentum; pile of fore coxae pale yellow except a few black ones at the tip, that of middle coxae black, and of hind coxae pale yellow.

Abdomen black, red laterally on segments two to five, sixth and seventh segments yellow. Pile on sides of first segment abundant, pale yellow; that on following segments unusually short and quite sparse, on second, third and fourth tergites mostly pale with a few black hairs on hind angles, on fifth, sixth and seventh mostly black. Pile on hind margins of last three tergites unusually short, black on fifth and sixth, mixed black and red on seventh. A fringe of black tomentum along hind margins of all tergites except seventh. Tomentum of second tergite white on basal half, black otherwise, the white narrowly tinged with yellow next the black. Tomentum of third ter-

PLATE II

Each antenna is figured twice, that on the left representing the dorsal, and that on the right the lateral aspect of the same antenna.

Fig. 13, *Exoprosopa butleri*, n. sp., allotype. Fig. 14, *Exoprosopa butleri*, n. sp., holotype. Fig. 15, *Exoprosopa sharonae*, n. sp., allotype. Fig. 16, *Exoprosopa sharonae*, n. sp. holotype. Fig. 17, *Exoprosopa cingulata*, n. sp. allotype. Fig. 18, *Exoprosopa doris* O.S., Utah specimen, female. Fig. 19, *Exoprosopa doris*, O.S., Utah specimen, male. Fig. 20, *Exoprosopa utahensis*, n. sp., allotype. Fig. 21, *Exoprosopa utahensis*, n. sp., holotype. Fig. 22, *Exoprosopa cingulata*, n. sp., holotype. Fig. 23, *Exoprosopa arenicola*, n. sp., allotype. Fig. 24, *Exoprosopa arenicola*, n. sp., holotype. Fig. 25, *Exoprosopa doris*, O. S., Utah specimen, male genitalia. Fig. 26, *Exoprosopa sharonae*, n. sp., paratype, male genitalia. Fig. 27, *Exoprosopa renicola*, n. sp., paratype, male genitalia. Fig. 28, *Exoprosopa butleri*, n. sp., paratype, male genitalia.

gite narrowly yellow basally, white at sides, black along caudal third, rest of tomentum mixed black and yellow, mostly black. Tomentum of fourth tergite white, tinged with yellow centrally and caudally; that of fifth mixed pale yellow and black, mostly black, centrally; mostly yellow on sides; that of sixth and seventh white, that on sixth tinged with yellowish apically. Ground color of venter mostly obscured by dense silvery white tomentum, evidently red except basally on first four segments. A fascia of black scales basally on fifth sternite, a few black scales on sides of sixth. Pile nearly white. Genitalia red.

Female.—Like the male in most respects. Only second and third tergites red on the sides. Tomentum of abdomen nearly all either black or white, very few of the scales showing the yellowish cast found in the male. Hairs of hind margin of seventh segment all black. The black tomentum of the mesonotum is reduced in extent to a fascia on each side and two spots on the anterior third of the disc. There are some pale scales on the base of the costa. The venter is largely black, only the hind margins of some of the segments being red. Spines of genitalia red. There are some yellow hairs on the under side of the first antennal segment.

Types.—Male *holotype*, Antelope Springs, House Range, Millard Co., Utah, August 10, 1943 (D. E. Johnson). Female *allotype*, southeast end Cedar Mts., Tooele Co., Utah, August 28, 1955 (D. E. Johnson). *Paratypes*: 3♂ same data as the holotype; 1♂ Cane Springs, Cedar Mts., Tooele Co., Utah, VIII-10, 1955 (D. E. Johnson); 1♀ Deep Creek Mts., near Callao, Juab Co., Utah, VIII-4, 1953 (H. E. Cott). The latter specimen is in the collection of the University of Utah.

The specimens at hand are remarkably uniform in size and coloration. Because of the very short pile on the lateral abdominal margins the specimens of this species have a very trim appearance.

The three localities where this species was encountered are all about the same type of ecological situations. In each case the specimens were collected on dry, rocky hillsides, among scattered Utah Junipers. All localities are above five thousand feet elevation. The type was collected about a mile north of the old Civilian Conservation Corps camp at Antelope Springs.

A COMPARATIVE OSTEOLOGICAL STUDY OF CERTAIN SPECIES BELONGING TO THE GENUS *BOLITOGLOSSA* (AMPHIBIA)[1]

Afton M. Hansen[2] and Wilmer W. Tanner[3]

Introduction

The Plethodontidae of Mexico and Central America are, in general, a divergent group of free-tongued salamanders. Within this group is the genus *Bolitoglossa*, which according to Tanner (1952) contains at least twenty-five species, three of which were then undescribed. The genus includes a rather divergent group of species, which may be divided into two sub-groups. The most obvious division is between the larger long-tailed species represented by the relatively primative *B. platydactyla* and the smaller short-tailed species represented by the more specialized *B. rufescens*.

In order to understand the two groups within the genus and the relationship of these segments of the genus to each other there has been a need for a detailed study of the skeletal anatomy. This study has been undertaken in an effort to determine some of the variations, as indicated by the skeletal anatomy, of both the larger long-tailed species, and the smaller short-tailed forms. Four species of the genus *Bolitoglossa* have been used, namely, *platydactyla* and *flaviventris*, representing the larger forms and two supposedly closely related species *rufescens* and *occidentalis*, representing the smaller forms.

The skeleton of *B. rufescens* was studied in more detail than were the others because of its availability and suggested aberrations. Taylor (1939) considers *B. rufescens* and *B. occidentalis* to be closely related and suggests that when their skeletal anatomy is better known it may be necessary to assign them to a new genus. This view is supported by Tanner (1952:629) in his study of the throat musculature in which he found the origin of the subarcuales rectus 1 and quadratopectoralis, as well as the positions of other throat muscles and cartilages, to be different than those of other members of the genus seen by him. On the basis of this he considered *B. rufescens* to be an aberrant member of this genus.

It is not the purpose of this study to attempt a major revision of the genus, but primarily to indicate wherein the skeletal characteristics of the four species listed above vary, and to what extent certain relationships in this genus are suggested by them. In doing this the following skeletal parts were compared: skull, atlas, trunk veretbrae, caudal vertebrae, carpals, and tarsals. Evidences of primitiveness were obtained by comparing the above parts with *Plethodon glutinosus* and *Salamandra salamandra*.

The work of Francis (1934) was especially helpful in giving the terminology and characteristics of *S. salamandra* as was the

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work of Cope (1889) in providing the skeletal characteristics of *P. glutinosus*.

Few studies have been made thus far which have been concerned with the osteology of the genus *Bolitoglossa*. Hilton (1946) figured some of the skeletal parts of *B. platydactyla* and discussed some of its characteristics. This work was not a detailed study, dealing chiefly with generic rather than intrageneric relationships. Again in 1948 Hilton published information on the vertebrae of salamanders, which was general, and also referred chiefly to generic variations.

The number of specimens available for this study was limited in the case of *B. occidentalis*. The descriptions and drawings of this species are based on a single specimen. Fortunately sufficient material of the other species was available.

Methods

In studying the skeletal anatomy of small specimens it is difficult to remove the skeleton, or parts of the skeleton fully intact. Inasmuch as the parts are small it is nearly impossible to study them completely by dissection. However, in examining the dorsal elements of the skull a careful dissection proved a rather quick reliable method.

The method used by the authors in preparing whole skeletons for study was the Schultz-Potash Method for clearing skeletons, and this was modified to suit our needs. The following treatment was the one used in preparing the materials for study. The treatment applies to specimens preserved in alcohol, but would no doubt work on others as well.

I. Skin and evisorate.
II. Place in 4.5% aqueous potassium hydroxide until the flesh is sufficiently clear to render the skeleton visible. (The length of time will vary with the size of specimen.)
III. Place in 1% aqueous potassium hydroxide to which has been added enough of a saturated alcohol solution of alizarin red (alizarin sodium monosulphonate) to color deep purplish red. Leave in solution until bones are stained to the desired color.
IV. Place in solution of: 50 parts 5% aqueous potassium hydroxide plus 50 parts of 5% aqueous glycerin.
V. Place in 10% aqueous glycerin plus 10-15 drops of concentrated ammonium hydroxide and leave for three days.
VI. Run specimen through 25% and 50% aqueous glycerin. Preserve permanently in absolute glycerin to which has been added 1 or 2 crystals of thymol to prevent mold growth.

A valuable aid in differentiating between cartilage and bone is to remove the specimen from the staining solution and place in 70% alcohol. This will extract the dye from the cartilage and leave the osseous parts stained a bright magenta. It was observed that the cartilage did not absorb the dye to the same extend as the bone, leaving the cartilage stained in a speckled pattern, whereas the bone was of a solid color.

All specimens were studied under the binocular microscope.

The measurements were taken under the microscope and all drawings made to scale. In order to have the drawings of nearly equal size in each specimen a different scale was used in many cases.

In some cases it proved advantageous to remove the head from the specimen and clear it separately, because in clearing, the bones had a tendency to clear more quickly and become disarticulated, especially the paravomerine teeth and the nasal bones.

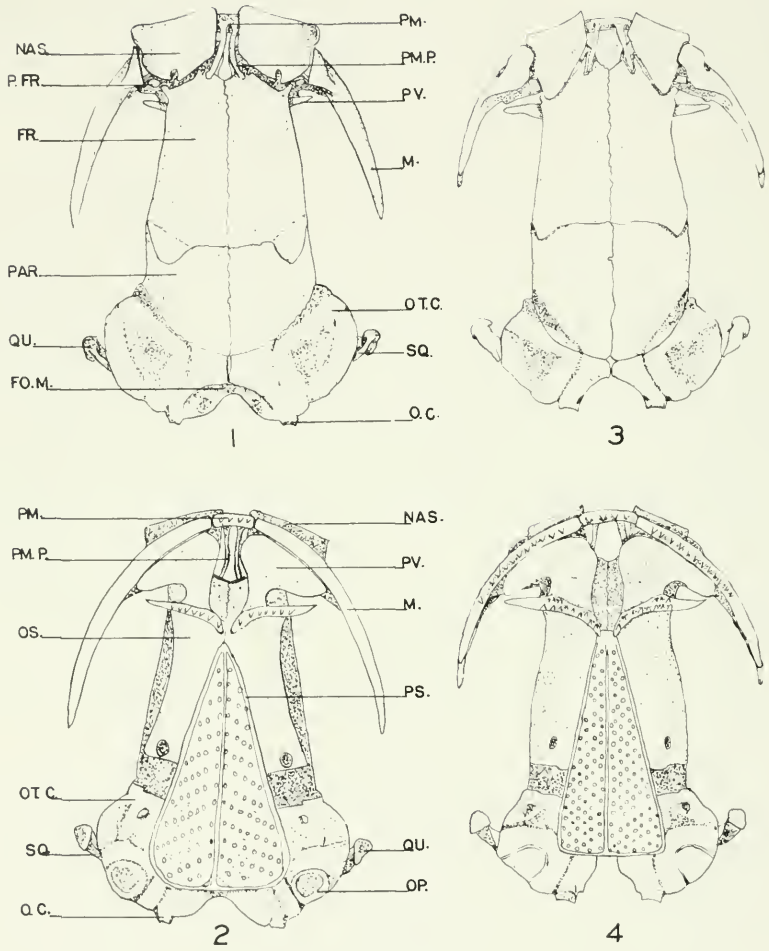
The terminology used herein was adopted chiefly from Francis (1934).

Osteological Descriptions

Bolitoglossa platydactyla (Cuvier)

SKULL (Fig. 5 & 6).—The following bones are visible from a dorsal view: premaxilla, maxillae, nasals, prefrontals, tips of the prevomers, frontals, parietals, otic capsules, squamosals and quadrates. All are paired except the premaxilla which lies between the maxillae thus forming the anterior most portion of the upper jaw. On the ventral surface of the premaxilla are approximately ten teeth, while the dorsal surface has two processes, which curve dorsocaudad underneath the nasal bones and terminate in flattened processes overlapping the edge of the frontals. Curved postlaterally are the maxillae which have approximately eighteen teeth on each side. The large rectangular nasal bones lie close together in the mid-dorsal line, but do not suture. They are bordered laterally by the maxillae and overlap the frontals with their caudal margins. Lying between the frontals and the maxillae are the prefrontals which may extend underneath the postlateral corners of the nasals. The large, rectangular frontals overlap the parietals with their post-lateral corners and are joined medially by the saggital suture. The larger parietals extend caudad to the otic capsules. Curved ridges on the dorsal surface of the otic capsules indicate the position of the semi-circular canals. The squamosals and quadrates attach to the lateral edges of the otic capsules.

The following bones are visible in a ventral view: premaxilla, maxillae, prevomers, frontals, orbitosphenoids, parasphenoid, otic capsules, squamosals and quadrates. These are all paired except the premaxilla and the largest ventral bone of the skull, the median parasphenoid. Two bony plates bearing approximately one hundred fifty teeth are attached to the sphenoid. Although these teeth have been referred to by most authors as "parasphenoid teeth," Taylor (1941:206) calls them the paravomerine teeth. Taylor's terminology is used in this study. The prevomers are deep to the nasal capsules and do not suture medially, thus a portion of the frontals may be seen deep beneath them. A single row of approximately eleven teeth are located on each prevomer. The orbitosphenoid is wider anteriorly than posteriorly and is bordered dorsally by the parietal and frontal, and ventrally by the parasphenoid. The posterior edge of the parasphenoid overlaps the otic capsules. Covering the otic capsule opening is the thin operculum bone. On the lateral edges of each otic capsule



Bolitoglossa rufescens (Cope): Fig. 1, Skull, dorsal view; Fig. 2, Skull, ventral view.

Bolitoglossa occidentalis (Taylor): Fig. 3, Skull, dorsal view; Fig. 4, Skull, ventral view.

Abbreviations: FO.M., foremen magnum; FR., frontal; M., maxilla; NAS., nasal bone; O.C., occipital condyle; OS., orbitosphenoid; OT.C., otic capsule; PAR., parietal; P.FR., prefrontal; PM., pre-maxilla; PMP., pre-maxillary process; PS., parasphenoid; PV., pre-vomer; QU., quadrate; SQ., squamosal.

are the squamosals and their attached quadrates. Approximately thirty teeth are born on the dentary bone.

ATLAS.—There are four articulating surfaces on the anterior portion of the atlas, which are similar structurally to those of other species studied. This vertebra is heavy, strong and with postzygapophyses being foot-like in that the articulating portion is large, round and has a slender process connecting it to the body of the vertebra. The median notch on the dorso-anterior border is not deeply cleft. The atlas is not obviously specialized and conforms with the other species described herein.

TRUNK VERTEBRAE (Fig. 13 & 17).—From a dorsal view the trunk vertebrae are noticeably longer than wide, with the transverse processes projecting laterad and caudad from the middle of each vertebra. The prezygapophyses are heavy and extend anteriolaterally beyond the centrum. The curved dorso-caudad part of the vertebra terminates in two spines posteriorly. Visible on the dorsal surface immediately anterior to the transverse processes is the thin, elevated median crest. Fifteen vertebrae preceed the sacral. On the postlateral half of the centrum is a lateral ridge extending slightly beyond the end of the centrum. There are no other crests, spines or wings present.

CAUDAL VERTEBRAE (Fig. 23 & 24).—The dorsocaudal portions of these vertebrae curve upward and terminate in two spines similar to those of the trunk vertebrae. There are no dorsal crests present. On each side is a lateral projection which extends anteriorly and lies immediately ventral to the prezygapophyses. The haemal arch terminates caudally in a bifurcated spine. Extending anteriorly from the median base of these spines is a thin haemal crest. All vertebrae are amphiceolous.

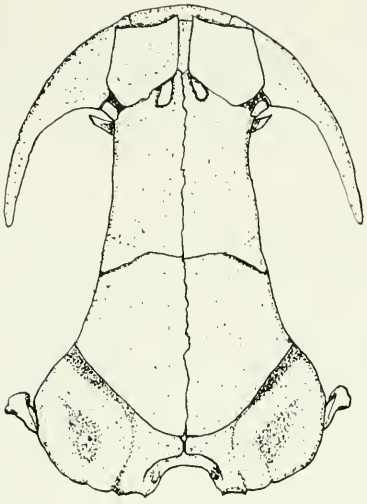
HAND (Fig. 27).—The carpi of the hand consists of the following eight elements: radiale, intermedium, ulnare, centrale, prepollicis, fused basal 1 & 2, basal three and basal four. Basal four is the largest with the fused basal 1 & 2 being next in size. The carpi are entirely carilaginous.

There are four metacarpals each with lateral webs and cartilaginous epiphyses. The phalanges are similar to the metacarpals in shape, but differ in size and number. There are eight phalanges and the formula is 1-2-3-2. All metacarpals and phalanges are bony.

FOOT (Fig. 30).—There are eight cartilaginous tarsi in the foot, which consist of the following elements: tibiale, intermediu, fibulars, pre-hallux, centrale, fused basal 1 & 2, basal three, and fused basal 4 & 5. The fused basal 4 & 5 is largest with basal 1 & 2 next in size.

The metatarsals are five in number, shaped like the metacarpals, are bony and with cartilaginous epiphyses. The phalanges are bony with cartilaginous epiphyses and present a formula of 1-2-3-3-2.

Summary.—A comparison of the skeleton of *Bolitoglossa flaviventris* with the skeletal anatomy of *B. platydactyla* indicates that



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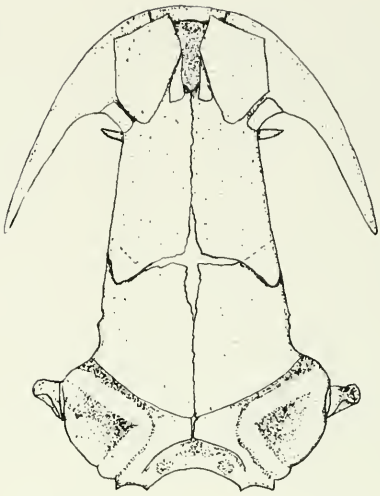

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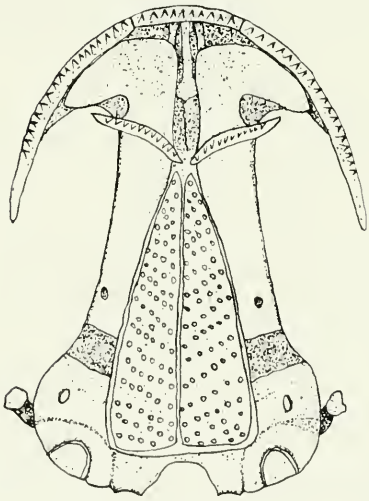

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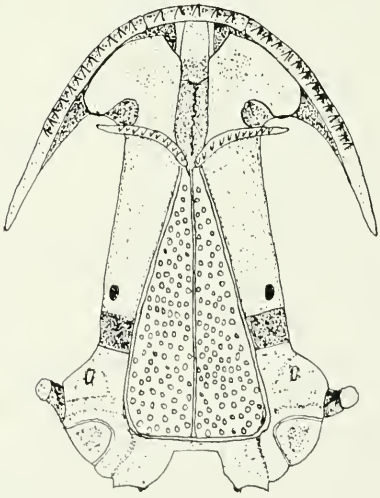

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the long-tailed species of this genus, as represented by these species, have retained in the main more primitive characteristics and reflect the characteristic of the generalized *Salamandra* and *Plethodon* more closely than do the short-tailed species.

The suggested close relationship of these two species is bourne out in the similarity of their skeletal anatomy. Both have dorsal crests on all trunk vertebrae, lateral ridges on the posterior of the centrum, eight carpals, the same number and arrangement of phalanges, and the skull characters are nearly identical. The main difference noted is the lesser degree of ossification in *B. flaviventris*, a condition which seemingly suggests that *platydactyla* is the more primitive of these two species.

An examination of the visceral skeleton and the throat myology also indicates a primitiveness comparable to that observed in their skeletons. The myology also indicates that the species *platdactyla* is the most generalized of the genus *Bolitoglossa*. In such species as *platydactyla*, *flaviventris* and *mexicana*, the origin of the M. quadrato-pectoralis is on the quadrate rather than the squamosal; the elongate fibers of the suprapenduncularis; the extensive origin of the M. geniohyoideus medialis and the large mass of pharyngeal muscles between the deep slip of the M. rectus cervicis and the suprapenduncularis, mark them as primitive. Furthermore, the presence of the M. rectus cervicis lateralis in *mexicana* is a mark of primitiveness in this genus.

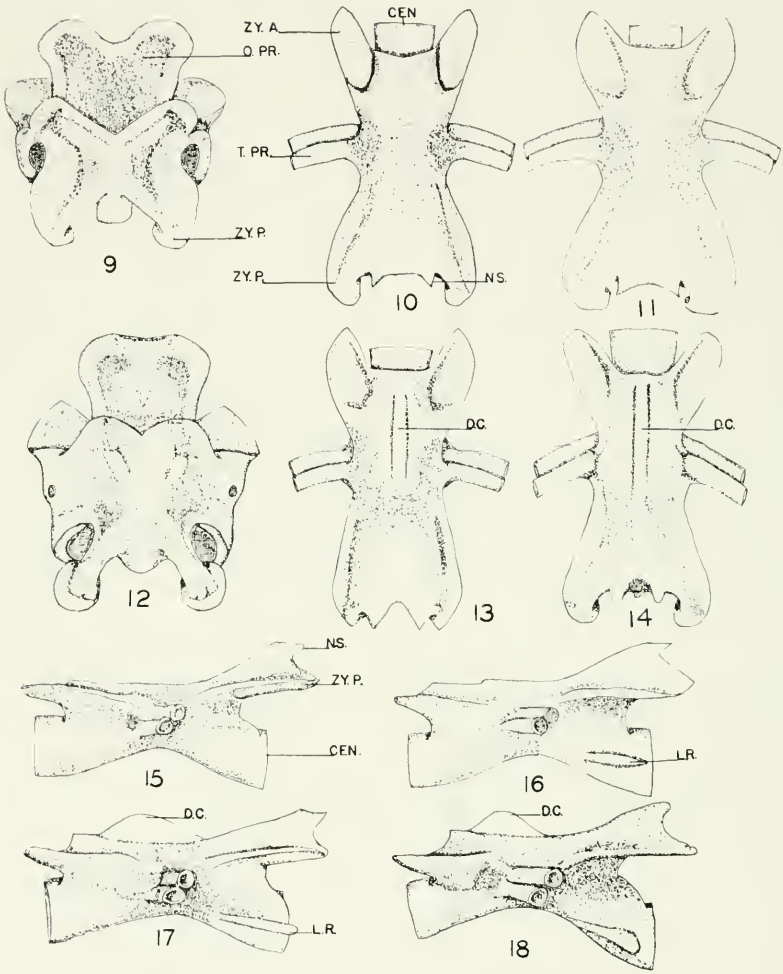
In contrast to the short-tailed species there is a long tail and the intercostal folds and grooves are prominant and obvious. These conditions we have come to associate with the more generalized species at least in this genus.

Bolitoglossa rufescens (Cope)

SKULL (Fig. 1 & 2).—The following bones are visible from the dorsal view: maxillae, premaxilla, nasals, frontals, prefrontals, prevomers, otic capsules, squamosals and quadrates. All are paired except the premaxilla, which is single and median between the maxillae. The ventral surface of the premaxilla usually has three or four teeth, whereas the dorsal surface has two processes which curve dorso-caudad and terminate in rounded ends overlapping a small portion of the frontal bones. The maxillae curve post laterally a distance equal to the total length of the frontal and nasal bone. There are no teeth present on the maxillae, a characteristic apparently possessed by only one other member of this genus (*B. colonnea*). The prefrontals are very much reduced, their presence was definite only in those which were carefully stained. They may be found between the anteriolateral corner of the frontals and the maxillae, and are seemingly not in contact with other bones.

The nasals are nearly rectangular in shape with the nostril

Bolitoglossa platydactyla (Cuvier): Fig. 5, Skull, dorsal view; Fig. 6, Skull, ventral view. *Bolitoglossa flaviventris* (Schmidt): Fig. 7, Skull, dorsal view; Fig. 8, Skull, ventral view.



Bolitoglossa rufescens (Cope): Fig. 9, Atlas, dorsal view; Fig. 10, Ninth trunk vertebra, dorsal view. *Bolitoglossa occidentalis* Taylor: Fig. 11, Ninth trunk vertebra, dorsal view. *Bolitoglossa platydactyla* (Cuvier): Fig. 12, Atlas, dorsal view; Fig. 13, Ninth trunk vertebra, dorsal view. *Bolitoglossa flaviventris* (Schmidt): Fig. 14, Ninth trunk vertebra, dorsal view. *Bolitoglossa rufescens* (Cope): Fig. 15, Ninth trunk vertebra, lateral view. *Bolitoglossa occidentalis* Taylor: Fig. 16, Ninth trunk vertebra, lateral view. *Bolitoglossa platydactyla* (Cuvier): Fig. 17, Ninth trunk vertebra, lateral view. *Bolitoglossa flaviventris* (Schmidt): Fig. 18, Ninth trunk vertebra, lateral view.

Abbreviations: CEN., centrum; D.C., dorsal crest; H.S., haemal spine; L.R., lateral ridge; N.S., neural spine; O.PR., odontoid process; T.PR., transverse process; ZY.A., prezygapophysis; ZY.P., postzygapophysis.

notch in their posterior border, varying in each individual. These bones extend anteriorly beyond the maxillae and premaxilla, and do not meet on the mid-dorsal line nor contact other bones. They are surrounded and held in place by membranes; this would seemingly provide for flexibility and may possibly aid in changing the size of the nasal capsules. The frontals are rather elongated with the posteriolateral corners overlapping the parietals. The parietals are not as long as the frontals although they are somewhat wider and extend back onto the edge of the otic capsules. The dorsal surface of each otic capsule has curved ridges, under which are located the semi-circular canals. On each side of the foramen magnum is located an occipital condyle, which remains almost entirely cartilaginous with only the deeper parts ossified and fused with the otic capsules. According to Francis (1934:26) this composite ossification is best called the occipitopetrosal bone. The ventrolateral surfaces of the foramen magnum articulate with the lateral portion of the odontoid process by means of two small facets. These might be termed the ventro occipital condyles. The squamosals project ventrally from the lateral sides of the otic capsules and are predominantly cartilaginous at their proximal ends. On the distal end of each squamosal may be seen the bony quadrates which articulate with the articular bone of the lower jaw.

The following bones may be seen from a ventral view: nasals, premaxilla, maxillae, prevomers, frontals, parietals, orbitosphenoids, parasphenoid, otic capsules, quadrates, and squamosals. They are all paired except the parasphenoid and premaxilla, which are located medially. The prevomers form a bony floor for the nasal capsules. Each bone articulates laterally with the maxillae except for a lateral notch which serves as the opening for the internal nares. From a ventral view the prevomers are separated, making it possible to see th premaxillary processes and frontals deep between them. Ventrally jaw consists of the toothed dentary, and the toothless articular and prearticular.

ATLAS (Fig. 9).—The atlas is not specialized and resembles that of *Plethodon glutinosus*. The odontoid process is approximately one-third the entire length of the vertebra and has on the anterior portion of the ventrolateral surfaces two condyles which articulate with similar surfaces on the ventrolateral surface of the foramen magnum. Near the proximal end of the odontoid process are two large surfaces which face anteriorly, and articulate with the occipital condyles. This type of articulation is found in *Salamandra salamandra*. The postzygopophyses are heavy projecting caudad approximately one-fifth of the total length. This vertebra is nearly circular in cross-section.

NINTH TRUNK VERTEBRA (Fig. 10 & 15).—All vertebrae of this species are typically amphicoelous. The body of the ninth trunk vertebra is elongated, being approximately twice as long as wide. Each transverse process is attached just anterior to the center

of the vertebra and curves posteriorly. The centrum is visible between the prezygapophyses anteriorly, posteriorly it is obscured by the postzygopophyses. The dorsal crest is absent and the posterior part of the neural arch extends caudodorsad terminating posteriorly in two widely spaced projecting spines. Ventrad to the transverse processes the centrum is constricted. There are no crests. ridges or spines present on any of the centra.

SIXTH CAUDAL VERTEBRA (Fig. 19 & 20).—The caudal vertebrae resemble the trunk vertebrae in size, but have only one transverse process on each side. These processes project anteriorly with the degree of projection increasing on each succeeding vertebra, until they are underneath and parallel to the prezygapophyses. There are no dorsal ridges or crests present, however, the caudal border has two prominent spines which project parallel with the inner edges of the postzygapophyses. The haemal arch forms a bifurated spine on the posterior part of the centrum and has a thin sheet-like bone projecting forward and ventrally. The centrum is hourglass shaped with no other spines. wings or crests.

THE PECTORAL GIRDLE.—The pectoral girdle resembles that of *Salamandra salamandra* as shown by Francis (1934). The scapular region forms the dorsolateral portion of the girdle and is there is a single row of approximately seven teeth on each ossicle. Two bony plates bearing teeth are loosely attached to the underside of the parasphenoid. These separate readily in macerated specimens. The paravomerine teeth are cone shaped and number more than 100. The orbitosphenoid projects dorsally from the parasphenoid but does not contact the parietals or frontals, being separated from them by a membrane. The parasphenoid overlaps the otic capsule with its posterior margins. Each otic capsule bears over its opening the thin operculum. The squamosals and the apparently fused quadrates are attached to the lateral edges of the otic capsules. The lower made up of the osseous proximal portion which is the scapula proper. and a distal cartilaginous portion forming the suprascapula. Distally the procoracoid is cartilaginous, spatulate shaped, and slightly concave, with the convexity being ventrally. The largest element of the girdle is the coracoid, which projects transversely across approximately three-fifths of the body, thus there is an overlapping of the right and left sides.

THE FORE-LIMB (Fig. 25).—The humerus is a long slender bone, small on the proximal end and expanding approximately three times at the cartilaginous condyles on the distal end. The larger radial condyle is separated from the ulnar condyle by the trochlear groove. Near the proximal head are two projections the crista ventralis humeri and the crista dorsalis humeri.

The radius and ulna are long slender bones with cartilaginous epiphyses at both ends. The radius is the larger. They articulate with the ulnar and radial condyles proximally and with the radiale, ulnare and intermedium carpals distally.

The cartiloginous carpi of adult specimens consists of seven elements, namely, the radiale, intermedium, ulnare, centrale, pre- pollicis, a fused basal 1 & 2, and a fused basal 3 & 4. The fused basal 3 & 4, is the largest with the fused basal 1 & 2 being next in size. Although there are the same number of carpi in *B. rufescens* as in *S. salamandra*, they are differently arranged. In *B. rufescens* the ulnare and intermedium remain separate and basals three and four are fused.

There are four spindle-shaped metacarpals with thin bony webs projecting laterally on each side. Metacarpals one and two articulate with the fused basal 1 & 2, whereas metacarpals three and four articulate with the fused basal 3 & 4. There are eight bony phalanges which resemble the metacarpals in structure, but are smaller in size. The formula for the phalanges, beginning with the first finger, is 1-2-3-2. Like other articulating surfaces in the fore-limb the metacarpals and phalanges are provided with cartilaginous epiphyses.

PELVIC GIRDLE.—The pelvic girdle appears ventrally as two plates, the pubo-ischia, which are separated by cartilage and bordered on the anterior by the pubic cartilages, which may be ossified posteriorly. The caudal ischium has two projections posteriorly. Ossification of the ilium is incomplete with one cartilaginous end helping to form the acetabulum and the other expanding into a large head which attaches to the transverse processes of the 16th vertebra. The acetabulum is a hollow cartilage lined cavity formed by the ilium and pubo-ischium.

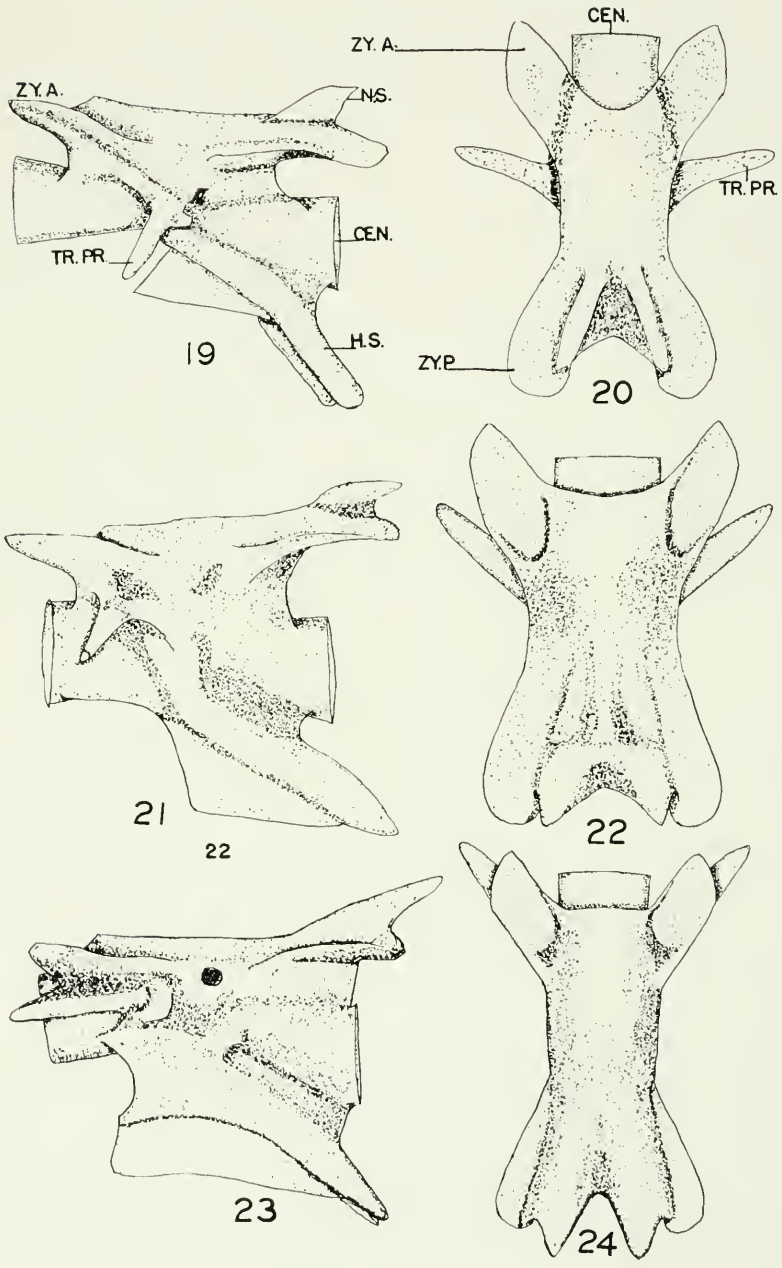
THE HIND LIMB (Fig. 26).—The femur is a long slender bone, larger distally than proximally, with a cartilaginous epiphyses and hook-like process the trochanter. The distal end has two cartilaginous condyles, the larger is the tibial condyle and the smaller the fibular condyle. They articulate with the tibia and fibula respectively.

The size and shape of the tibia and fibula closely resembles the radius and ulna of the fore-arm.

Tarsi are seven in number and resmeble the carpi of the hand. The tibiale, intermedium and fibulare appear in a row and articulate with the tibia and fibula. The centrale lies centrally and is surrounded by other tarsi. The pre-hallux is latero-distal in position, next to the centrale and between the fused basal 1 & 2 and the tibiale. There are two basal elements, the smaller articulating with metatarsals 1 & 2 is composed of fused basals 1 & 2. The second articulates with metatarsals three, four and five and is composed of basal 3 & 4 & 5.

The five metatarsals and the phalanges are bone except for the cartilaginous epiphyses at their ends. The phalangeal formula is 1-2-3-2-2.

Summary.—A comparison of *Bolitoglossa occidentalis* with the skeletal anatomy of *B. rufescens* reveals that the short tailed group of this genus, as exemplified by these species, has undergone a general reduction in: (1) the size of the dorsal crest of the trunk vertebrae;


ZY. A.
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(2) the size of the lateral ridges on the posterior half of the centrum; (3) the size of the prefrontals; (4) the numbers of carpals and tarsals; (5) the degree of ossification.

In *rufescens* both the dorsal crests and the lateral ridges are absent. This tendency toward reduction is also reflected in the reduced or lacking prefrontals, the membrane surrounding the small nasal bone and in the membrane between the lateral edges of the ventral orbitosphenoids and the dorsal parietals and frontals. *B. occidentalis* is less specialized than *B. rufescens* in that these extreme modifications are not yet apparent. Both the dorsal crests and the lateral ridges are present (but reduced in size) on the anterior vertebrae, and although the prefrontals and nasals are small or lacking, the membrane surrounding the nasal and separating the orbitophenoid from the dorsal bones is absent. This same degree of specialization is also reflected in the absence of maxillary teeth in *rufescens* and their presence but reduced numbers in *occidentalis*.

On the basis of throat anatomy the small *rufescens* is obviously the most specialized of the genus as well as of the short tailed group. This is seen primarily in the origins of the M. subarcualis rectus 1. and M. quadrato-pectoralis. In the latter the entire origin is on the squamosal rather than the quadrate. Equally significant is the obvious posterior position of the ceratohyal when contrasted to the more primitive long tailed species.

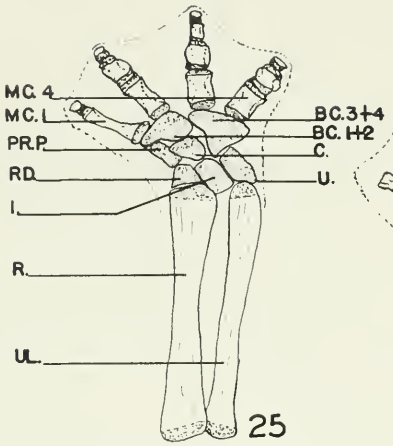
There is seemingly a relationship between *rufescens* and *occidentalis* reflected in the muscles and cartilages of the throat which is comparable to that existing in the skeletons.

Summary and Conclusion

The Plethodontidae represent a specialized group of salamanders, which according to Dunn (1926), were derived from some representative of the genus *Salamandra*. They show certain characteristics in their skeletons that seem to be reductions of those found in *Salamandra*. Examples of these reductions are: lack of pterygoid bones, lack of an actual posterior projection of the prevomers, and a reversion to the amphicoelous type of vertebral articulation as compared to the opistocoelous type present in *Salamandra*. (The latter character would seemingly indicate that the ancestral stock was more primitive than the modern species of *Salamandra*.) The skull is ossified, but is simplified (are specialized) when compared with the above mentioned prototype. This simplification is effected by a loss of certain skull bones and by a reduction in the size of others. The carpals and tarsals, which are mostly ossified in *S. salamandra*,

Bolitoglossa rufescens (Cope): Fig. 19, Sixth caudal vertebra, lateral view; Fig. 20, Sixth caudal vertebra, dorsal view. *Bolitoglossa occidentalis* (Taylor): Fig. 21, Sixth caudal vertebra, lateral view; Fig. 22, Sixth caudal vertebra, dorsal view. *Bolitoglossa platydactyla* (Cuvier): Fig. 23, Sixth caudal vertebra, lateral view; Fig. 24, Sixth caudal vertebra, dorsal view.

Abbreviations: CEN., centrum; H.S. haemal spine; N.S. neural spine; TR.PR., transverse process; ZY.A., prezygapophysis; ZY.P., postzygapophysis.



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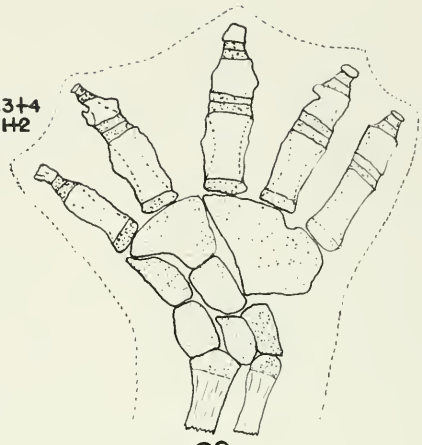

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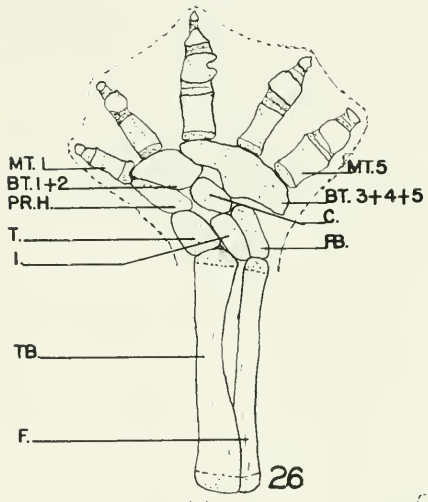

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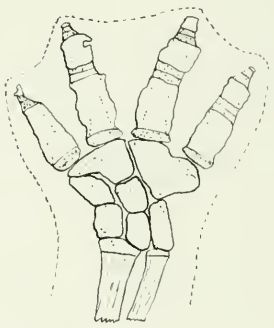

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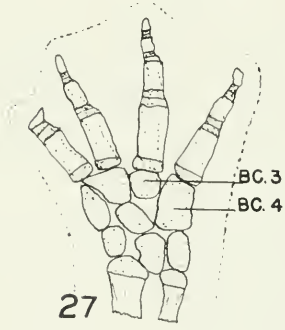

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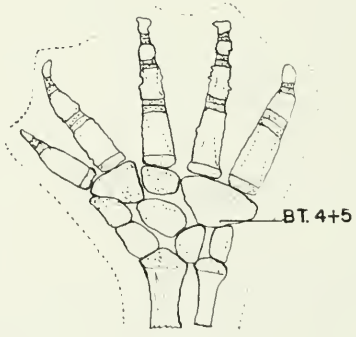

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are cartilaginous in the four species of the genus *Bolitoglossa*.

There has been a reduction in the number of tarsals from the nine found in *Plethodon glutinosus* and *Salamandra salamandra*, to the eight found in *B. platydactyla* and *B. flaviventris*, to the seven found in *B. rufescens* and *B. occidentalis*. This reduction seems to result from a uniting of the basal tarsals into various combinations. Although *B. occidentalis* and *B. rufescens* have the same number of carpals as *S. salamandra*, there is a difference in the combinations. In the former the basals three and four become united, whereas the latter have the ulnare and intermedium united. In the hand of *B. platydactyla* and *B. flaviventris* these bones remain separate and there are, therefore, eight carpals. The tendency seems to be toward a reduction in number of carpals and tarsals as specialization occurs.

The formula for the phalanges of the fingers is the same in the four species studied, except *B. occidentalis*, which has only two phalanges on the third finger as compared to three in the other species. The phalangeal formula for the foot of *B. platydactyla*, *B. flaviventris* and *S. salamandra* is 1-2-3-3-2. *B. occidentalis* deviates from this in that there are only two phalanges present in the third and fourth toes whereas *B. rufescens* differs in having only two phalanges in the fourth toe.

Those data presented by Taylor (1944) concerning the skeletal, external and mouth anatomy, and that of Tanner (*op. cit.*) on the throat anatomy, provide essentially the same evidences as the data thus far obtained from the more detailed study of the skeleton, namely that: (a) The long-tailed species of this genus as represented by the primitive *platydactyla*, as well as *flaviventris* and *mexicana*, are most generalized in their anatomy in all anatomical systems, and thus represents a rather distinct group of species within the genus. (b) The short-tailed species represented by *rufescens* and *occidentalis* are specialized and represent an equally distinct group of species. Furthermore, these two groups can be readily segregated and could, if limited to those species presented in this study, be recognized as separate taxonomic units.

Unfortunately, many of the species of this large genus are not

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Bolitoglossa rufescens (Cope): Fig. 25, Right hand, dorsal view. *Bolitoglossa rufescens* (Cope): Fig. 26, Right foot, dorsal view. *Bolitoglossa platydactyla* (Cuvier): Fig. 27, Right hand, dorsal view. *Bolitoglossa occidentalis* Taylor: Fig. 28, Right foot, dorsal view; Fig. 29, Right hand, dorsal view. *Bolitoglossa platydactyla* (Cuvier): Fig. 30, Right foot, dorsal view.

Abbreviations: BC 1-2, fused basal carpals of the first and second fingers; BC.3, basal carpal of the third finger; BC.4, basal carpal of the fourth finger; BC.3-4, fused basal carpals of the third and fourth fingers; BT.1-2, fused basal tarsals of the first and second toes; BT.4-5, fused basal tarsals of the fourth and fifth toes; BT.3-4-5, fused basal tarsals of the third, fourth and fifth toes; C., centrale; F., fibula; FB., fibulare; FO.M., forearm magnum; FR., frontal; I., intermedium; MC.1, metacarpal of the first finger; MC.4, metacarpal of the fourth finger; MT.1, metatarsal of the first toe; MT.5, metatarsal of the fifth toe; PR.H., pre-hallux; PR.P., pre-pollicis; R., radius; RD., radiale; T., tibiale; TB., tibia; U., ulnare; UL, ulna.

available for study nor has any one been so fortunate as to critically study the entire genus. We suspect therefore that there may be additional intrageneric groups when the entire genus has been as thoroughly studied as the few species listed above. We also note from the data at hand the possibility of an intermediate group of species, between the extremes of specialization which would so intergrade one with another as to prevent even the delimiting of the apparently distinct subgenera. Although there are seemingly two distinct groups, we are not yet prepared to designate, with clarity, the limits of these or any other subgeneric groups in the genus *Bolitoglossa*. A careful study of the bolitoglossids from Central and South America will obviously aid in bringing about a clearer understanding of this large diversified genus.

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LIFE HISTORY NOTES ON *CALLIGRAPHA MULTIPUNCTATA MULTIPUNCTATA* (SAY) (COLEOPTERA, CHRYSOMELIDAE)[1]

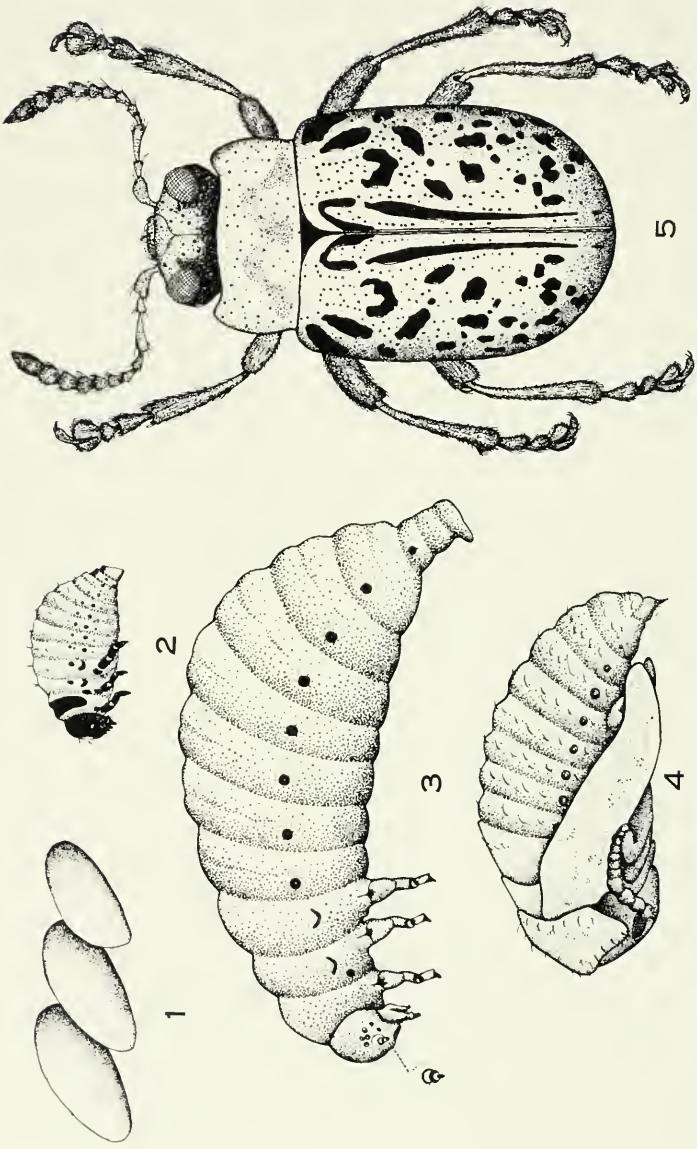
by Vasco M. Tanner

For several years the writer has been gathering information on the immature insects of this area. During the spring and summer of 1958 special attention was paid to the gathering of data on the life history of the Coleoptera. The following observations on the development and behavior of *Calligrapha multipunctata multipunctata* (Say) are recorded for the benefit and aid of students of this family in this area.

This species does not seem to be common in Utah. The writer is not aware of any information on its breeding habits in this area. On May 23, 1958, a small colony of breeding males and females were encountered on willows along the Jordan River two miles West of Lehi, Utah. It was a warm, sunny forenoon when these were first observed. Many pairs were in copula. Only a few clusters of eggs were found, and none of the eggs were observed to have hatched. Thirty pairs were collected and placed in a gallon glass jar along with twigs of the host plant *Salix melanopsis* Nutt. These were brought back to the laboratory and placed in breeding cages in which the bottoms were covered with soil and a small bottle of water containing fresh willows placed in the cages. Fortunately, this particular willow is close at hand since it grows along a stream which passes through the campus and near the laboratory. Five copulating pairs were placed in each of four cages. Only one mating pair was placed in the fifth cage. Before leaving the laboratory at 7:00 p.m. on the day the specimens were collected, May 23, I observed that the single pair in the one cage were in copula. Upon observing this same pair the next morning at 7:00 o'clock, they were still in copula, and the male did not leave the back of the female until 11:00 p.m., May 25. Careful observations were made of this mating pair during the period except at night. There is no evidence, however, that the pair was in continuous coition throughout this period. However, the position of the male as indicated above was not changed throughout the 40-hour period. The first eggs, a cluster of five, were oviposited by this female at 9:00 a.m. the next morning, ten hours after coitus. During the next three days this female laid a total of 31 eggs.

The eggs (Fig. 1) are 1.5 mm in length, .5 mm in diameter, and are a light lemon yellow in color. The eggs began to hatch on the fourth day after being laid. The first instar larvae (Fig. 2) began feeding within a few hours after hatching. No records were kept on the number of instars or the length of the stadia. The larvae (Fig. 3) feed for an average of 23 days before they left the host plant and went into the soil to pupate. The pupal (Fig. 4) period

1. Contribution No. 103, Department of Zoology and Entomology, Brigham Young University.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lasted for an average of 20 days. The first adult (Fig. 5) emerged on July 16. Thus, from the laying of eggs on May 25-26 to the emergence of an adult beetle was 52 days or about seven weeks. The overwintering adults which were placed in the breeding cages were observed to feed and sporadically copulate and lay eggs for a period of six weeks. Several of the adults which were collected on May 23 were still alive and feeding on August 17 when they were removed from the cages. The new generation adults which began emerging on July 16 began feeding, but there was no evidence of mating. Hibernating specimens were removed from the cages on October 24.

Overwintering and new generation specimens were pinned for cabinet use. Many of these were studied to determine the extent of the variation of the elytral markings. It is surprising to see how constant and what little variation there is in the color markings of this species. The original colony along the Jordan River was observed several times to see if any parasites could be found. None were detected. The development of larvae and the longevity of the adults seem to be similar in the natural conditions as under a laboratory environment.

Two other species of willows were placed in three of the breeding cages to see if they would be used as food by the adults or the larvae. It was very obvious that there was a marked preference for *Salix melanopsis*. The observations on *C. multipunctata* in this preliminary study seems to confirm the findings of W. J. Brown[2] on several Canadian species of this genus. Additional future observations on this and other Utah species of *Calligrapha* should be made.

I express my thanks to Mr. Hugh B. Leech of the California Academy of Sciences who kindly checked the determination of specimens of this beetle for me and Professors B. R. Harrison and Earl Christensen of the B.Y.U. Botany Department who determined the species of willows.

2. W. J. Brown. 1945. Food-Plants and Distribution of the Species of *Calligrapha* in Canada, with the Descriptions of New Species (Coleoptera, Chrysomelidae). The Canadian Entomologist. Vol. 77, No. 7. pp. 117-133.

Figures 1-5, *Calligrapha multipunctata multipunctata* (Say). 1, eggs; 2, first instar larva; 3, last instar larva; 4, pupa; 5, adult.

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